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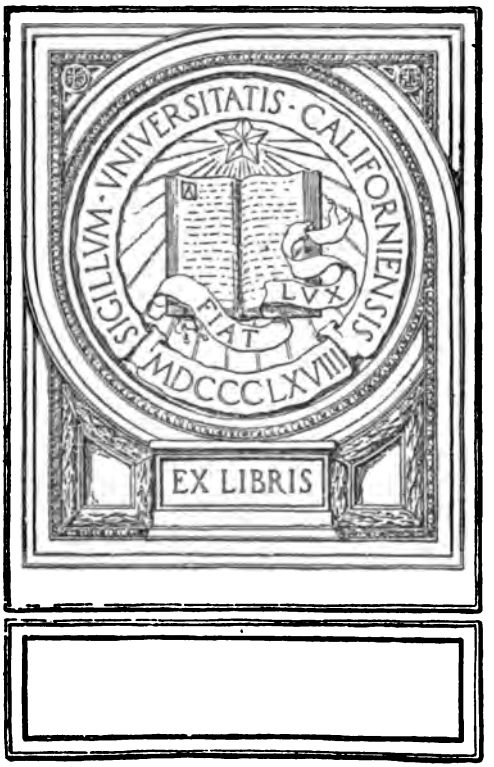
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Cost Control and Accounting for Textile Mills

BY

EUGENE SZEPESI

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UNIV. OF CALIFORNIA

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TO

HARRINGTON EMERSON

"PATH-FINDER OF MODERN MANAGEMENT"

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PREFACE

This volume was made possible through the faithful cooperation of friends and associates who have rendered generous assistance and advice and to whom I wish to express my sincere appreciation. Special acknowledgments are due to Mr. James A. Elliott, for constructive criticisms and assistance in the development of the control accounts, and to Mr. J. H. Bragdon, to whom the lion's share is due for the constant inspiration to undertake the development of such a difficult task. The readers will realize that it is impossible to present every shading of changes of conditions that might occur in mill management, and the main task was to present sufficient illustrations and material for the development of a control suitable to meet individual requirements. If this volume will assist in the development of better cost control methods in the Textile Industry, all efforts have been well paid for.

EUGENE SZEPESI

January 28, 1922
673 Boylston Street
Boston, Mass.

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INTRODUCTION

The discovery of glass was due to an accident; but the development of the modern miscroscope lense with its proper proportion of silicate and salt, thickness, angle of deflection and polish is a result of a scientific observation, forced by a need for such an instrument. So is modern business economy, involving production and its control, a necessity; and scientific mill management and control of the cost of manufacturing are the two modern instruments developed to meet the requirements. A presentation, statement or discussion of the theory and practice of the latter is the purpose of this book.

The origin of modern cost control would be hard to sketch. To attempt it would be wasted effort from the standpoint of usefulness. The iron bound law of supply and demand, which is the base of activity, is the fundamental law of commerce. It runs in a regulated channel, dammed with regulated credit and other institutions that lessen the risk of adventures on the sea of commerce and industry.

Through our world-wide and swift communicative facilities, changes of supply and demand are known in all quarters of the globe as they occur, and how fast industry is capable of meeting the changes is being demonstrated almost every day. Readjustments are being made with almost no disturbance and loss to our commercial and industrial institutions.

As long as supply and demand are the base of all activities, the only predetermined factor in the case of competitive articles is the selling price. The accepted offer of the lowest bidder at once becomes the foundation for prices. A minimum limit is reached when the producer feels that no more reduction

is possible without sacrificing profit, which is the just demand of capital, the result of competition, the stimulating elixir of modern business and the only instrument of industrial progress. The lowest market price for the selfsame article, with all other factors equal, is your selling price and you will have to meet it. Here is the pivot upon which the whole structure of modern cost control is turning.

The producers of the past produced first and sold afterwards. Modern industry sells first and produces afterwards. Our ancestors needed no extensive control methods, since they knew definitely the cost of their wares, and thus their efforts were entirely concentrated in obtaining the cost of production and as much profit as the buyer was willing to pay.

You sell your product based on a sample or on certain specifications. Your lowest selling price is based either on the results of past experience, or on observation of a limited experiment. Your profit, which measures the safety of the capital and the success of the business, depends upon how closely you can recreate the conditions under which you have accepted the production of the goods; and these conditions, by the nature of modern business, are in turn controlled by the price asked by your competitor, whose ability to command cheap capital and whose cleverness in producing set the lowest selling price for the merchandise.

Looking at this fact from another angle, the demand for an article may be so well stimulated that the selling price is fixed by the producer and not by the buyer; but in this case, again, competition forces the lowest bid for the article, and the producer faces the selfsame conditions as previously; namely, the predetermined price first and production afterwards.

So there is no relation between manufacturing cost and selling price. The existence and extent of profit will depend entirely on how skillfully a producer is able to keep his cost

of production within the estimated limit, in face of the fact that past conditions can seldom be reproduced and the factors of production are ever changing.

To meet these conditions of modern production and assure that cost of manufacturing never exceeds the estimated cost, ways and means of control have been devised which enable the manufacturer to check the diverse factors of cost at frequent intervals and prevent, while it is yet possible, a loss of the anticipated profit by correcting and eliminating such factors of cost as are in excess of the original estimate. A chain of such control methods, if developed with a definite aim, is known as a Cost System, and the science of the ways and means by which such a system must be developed is known as Cost Accounting.

Cost accounting, in the meaning above, is comparatively new. Like Scientific Management, it has been called to service to assist in eliminating preventable losses; in other words, to keep production in its predetermined channel. Scientific Mill Management and Scientific Cost Control go hand in hand, and the former is impossible without the latter. While Management is constantly on the watch for improved methods of production and the reduction of waste of any nature, the Cost System is the mirror in which all activities are reflected. Imperfection of management, magnitude of wastes and excessive cost are shown not only at the end of the year when the trial balance is drawn, but constantly, and what is of the most importance, such deficiencies of production or excessive cost are shown exactly in their right locations, throwing a spotlight on the causes of their existence.

Since healthful competition is possible only when it is met on level ground, proper cost accounting has come into prime importance. Recent industrial history is crowded with warnings of how unhealthy competition has not only destroyed certain industrial branches but destroyed capital itself. It is

improbable that any manufacturer would, with the full knowledge of facts, offer to produce and sell a commodity without profit or at a loss to his capital. Yet instances of this kind are common and within the knowledge of everyone. The selfsame article would have probably just as well found its way to the market at a higher selling price, leaving the essential margin of profit for all producers, if somebody without proper cost controlling facilities had not been unconsciously guilty of underestimating his own cost and set the selling price too low. Other producers do not care to be left out of the race, and, under the misconception that the lowest price setter's manufacturing capabilities can be duplicated in their own plants, they keep the article on the market until the yearly balance sheets force them into other fields or a change of tactics.

The causes of such unhealthful competition can invariably be traced either to a lack of cost controlling facilities on the part of the mischief maker, or to a lack of standardization in the methods themselves. This evil has been recognized by every manufacturer and, in many industries, definite steps have been taken for the development of uniform cost control methods. Unfortunately, no branch of the textile industry has carried such projects much further than to discuss them, in spite of the fact that the loss from and the wrong of this evil are well known to every producer.

When the importance of a uniform cost method for each branch of the industry is fully realized, developed and universally adopted, unfair competition will cease to be a harmful factor, and all makers of an article will be on an even basis; success depending on individual skill and ability to manage.

UNIV. OF CALIFORNIA

COST CONTROL

CHAPTER I

THE COST CONTROL FACTORS OF AN ARTICLE

Economically speaking, profit is the only purpose of production and commerce. But profit is not that capricious, inconstant thing it may appear to be from a perfunctory view. The axiom that returns on capital are in proportion to the risk is well known to every business man, yet very few have taken the trouble to look into the articles of their own manufacture, and, in case of new openings or unsatisfactory returns, to analyze the articles in question from an economic point of view. Many attractive looking projects of manufacture would be abandoned if such an impartial analysis were made, and also the question of cost control would meet with greater sympathy and better application. In addition, such analysis would demonstrate the relative importance of the various cost factors and a clear view would be gained of the true requirements of a proper cost system. With such knowledge on hand, there is no danger of mingling the important problems of control with those of less importance. This is the most common cause of so called " red tape."

For illustration, four articles are selected, representing the four extremes of the law of capital returns. It will be seen that in each instance the nature of the article will

ultimately limit the profit and any excess can be of only a temporary nature. Business, like water, finds its own level.

Sudden shiftings of demand, brought on by extraneous causes, such as those existing during the period of the World War, seem to defy the law that business seeks its own level; but with the increased demand for normal products after the war, practically opening world markets anew, opportunities need close analysis in order to distinguish real metal from mere tinsel.

The following is the basis for procedure in analyzing an article. The five main factors to be determined are:

Cost of Raw Materials
Cost of Labor
Cost of Manufacturing Burden
Cost of Selling
Profit

It will be clear to everyone that the higher the value of raw material entering into an article in relation to the selling price, the lower will be the profit on the commodity. This is so because labor and the other expenses entering into production increase the capital requirements for manufacture, and, as can be seen from every-day examples, competition is in proportion to the capital required for producing an article. But there are other factors that regulate profit, — the time required for the turnover of the capital, also the stability of the market.

After these cost factors are determined, a chart is constructed which will represent by circles the relative importance of the factors, as shown in the accompanying illustrations.

Let us see how these illustrations work out in the following four examples:

The first article selected is cotton yarn; (Form 1) a staple with a constant market, quick turnover and minimum risk. Cotton yarn is mostly material; the labor and other expenses, compared with the cost of material, are small. Because the market is constant, competition is keen and the unit profit is generally very small. For these reasons, the selling expense is negligible, and the return on capital depends entirely upon how fast the capital can be turned over and reemployed in production.

The cost and control system for a mill producing such an article will have to be organized with the relative importance



Form 1. Analysis of a Staple Article

of the factors in mind. A comparison of the profit with the cost of raw material will undoubtedly suggest that the control of waste is of prime importance, and extreme measures will be enforced at this point. In other words, control of the use, flow and care of raw material will be enforced to the maximum degree, for waste in any form is most dangerous to profit.

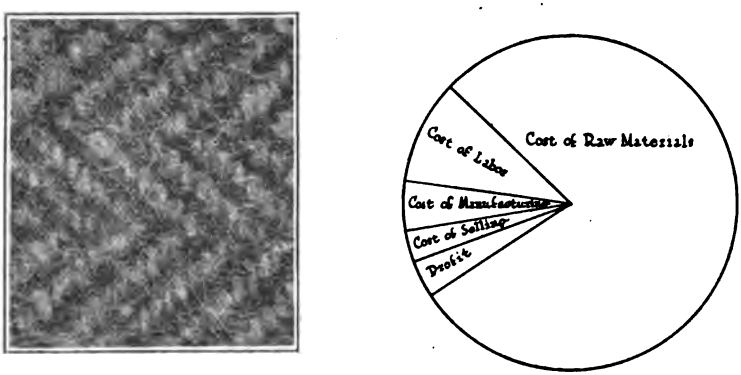
Labor is the next factor. Its control will not require extreme measures, but only a departmental division and other simple means to obtain unit departmental costs.

Manufacturing expense is even less important; so the

charges will be made to the departments in totals and not according to lots of production.

Cost of selling items will be bulked.

Now let us turn to the next example. (Form 2.) This is a fancy woolen suiting of low grade raw material; a cheap, seasonable article the demand for which is erratic. A comparison of the cost of raw material with the other factors tells the story of such an article. Here, labor is high. The manufacture of the goods requires almost as much labor as a material of double the cost. The risk of wastes and losses of



Form 2. Analysis of a Cheap Seasonable Article

labor being in proportion to the extent of labor involved, the cost control method in this case will lay greater stress on the labor factor, which will not be dealt with collectively as in the first instance, but will be recorded separately for each unit of production.

Manufacturing expense will as yet be allotted to departments only, but the details of control will be more rigid than in the preceding case.

Selling expense will be another item requiring extreme supervision. Being a seasonable article, the selling will require greater effort, a more extensive search for market out-

lets, and consequently greater reward, all of which mean increased selling expense. The control of selling will now require analytical methods, and the relation of the goods sold to the total output will be anxiously watched by the producer.

Profit in this case is high on the face value, but will dwindle to the normal level on close examination. The capital turnover on such goods is slow, therefore it has to work twice as hard, which again will find expression in the size of the profit on the unit of the article. The business also carries a double risk; first, the risk of increased labor and, second, the risk of the outlet, which in the case of seasonable goods is more or less uncertain.

The third illustration taken is a high grade staple, for which silk hosiery has been selected. (Form 3.) This is a case where the persistence of a few individuals in forcing a novelty stimulated the demand to such extent that competition was attracted and in turn created a demand for special machinery. As is the case in every instance when one interest is behind another interest, the capital invested by machinery manufacturers forced competition, which was possible during a period of general prosperity. So this became an article which could be designated as a high grade staple, where the cost of raw materials is predominant in the make-up.

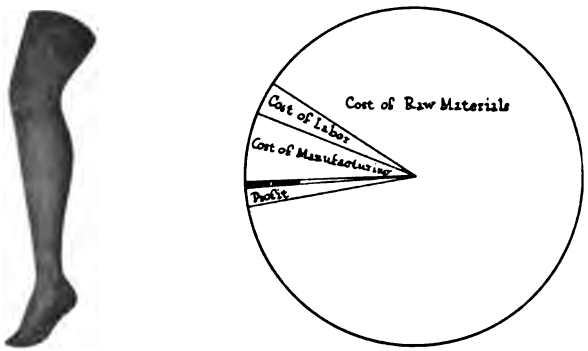
This high cost of raw materials requires extreme measures in the control of purchasing methods, and the system will not be satisfactory unless detailed control methods are employed for each phase of manufacturing.

The labor item is comparatively small. Here we have the reverse of the example immediately preceding. In the manufacture of a similar article of cheaper material the labor expense would be hardly less than for the silk hosiery, and the risk on the raw material would be lessened proportionately. So labor control can be dealt with collectively.

In regard to manufacturing expense, the damage to ma-

terial during production is a constant danger to the profit, and this item belongs to the manufacturing expense. The high selling price demands perfect merchandise, and the slightest imperfection will reduce its market value. The control system, therefore, will lay special stress on production damages and reflect this factor in full detail. The management will nervously compare every day the imperfect goods produced with the total production, and reckon the reduced market value of the seconds. This factor is the greatest danger to profit.

The selling expense is small, so it will be dealt with col-



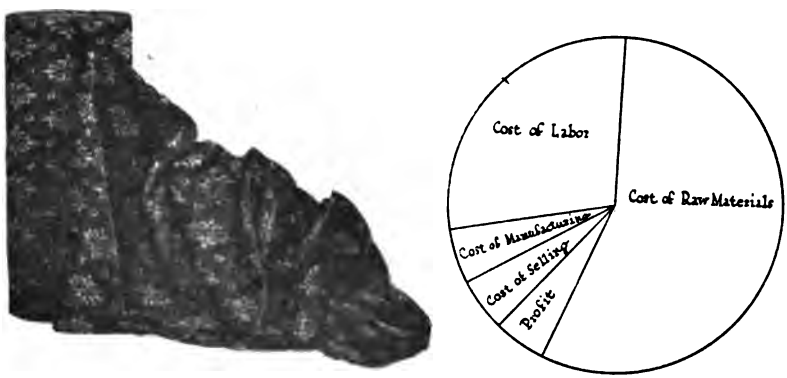
Form 3. Analysis of a High Grade Staple Article

lectively. The profit is in proportion to the capital required on account of the expensive raw material.

We finally arrive at the extreme example; a high grade seasonable article—a novelty silk fabric—with expensive raw material and labor. (Form 4.) Here the labor cost is almost as high as the cost of materials. The high cost of both will require extreme control methods, so the unit of control for both purposes will be minutely divided and every stage of manufacturing will be carefully compared with the cost estimations. This is also true of the proportion of damaged product to the estimated allowance.

Selling expense will have the same detailed care. While the skill required in production, combined with the seasonable character of the commodity limits competition, the limited demand for the article necessitates stimulation of sales to give an adequate return on the capital and skill invested. Therefore, vigorous selling campaigns, including extensive advertising, will be necessary.

Selling expense is extreme, and as there is a limit to the



Form 4. Analysis of a High Grade Seasonable Article

selling expense an article can carry, its relation to the unit cost must be carefully watched.

The profit on such goods is high, but so is the risk of production and distribution. Being an outright luxury, the article will be among the first to suffer during the slightest economic depression, and so profits must be high enough to accumulate a reserve for such a time and replace the capital losses.

With the completion of the foregoing examples of cost analysis, we can sum up the requirements of cost control organization. The conclusions to be drawn are as follows:

1. *The intensity of a scientific cost control method must be in proportion to the cost factors.*

2. *If unit profit on an article is small, the capital turnover must be large, and the risk taken through labor and expense factors must be small.*
3. *A high selling expense is justified only on seasonable products, and the sales must be in proportion to the quantity necessary to insure profit. Profits must be high enough to pay for all equipment secured for the manufacture of the specialty and compensate for the possible market limitations. In other words, the net profit, after deducting the risks, should yield at least as much as a staple article would.*
4. *The profit must be in proportion to the capital investment. On articles requiring an extensive stock of raw material secured far ahead of use, or expensive raw materials, the profits must compensate capital for such slow turnover.*
5. *High risk cannot be taken without high profit. Luxuries carry the highest risk, so profit must be large enough to make good the occasional losses suffered by the capital.*

This concludes the discussion of the analysis of production and market, and we can now satisfy our curiosity as to what is meant by the cost of an article.

CHAPTER II

THE COST OF AN ARTICLE

There is no absolute zero, nor absolute maximum. In expressing magnitudes or quantities, we compare them to convenient units. Coal is compared to a weight measure known as the ton, but an absolute ton of coal could be obtained only by mere chance. With a highly sensitive chemical scale, the measurement would be more exact than with a platform scale, but the labor and expense involved in the former method of weighing would exceed many times the value of the difference between the two measurements.

Watch a merchant measuring ten yards of cheese cloth and then watch him measure ten yards of brocaded silk fabric. His care and exactness will be in proportion to the value of the article.

The same principle applies in measuring everything. The unit measure should be exact, practical and economical, and the fineness of comparison should be in proportion to the value of the commodity. Whether this latter is a pound of cotton, labor per hour, power per machine, or interest on investment, the original hypothesis stands just the same. The exactness of the measurement will be in proportion to the value.

So red tape, the dread of the practical business man, is nothing less than measuring coal on a chemical scale. On the other hand, there is an analogy between the careless, shiftless cost system and the Coney Island "I-guess-your-weight" artist. They are both a few pounds off, more or less.

A scientific cost system, which is nothing more than a common sense cost system, first lays stress upon the correctness of the measuring units, then uses the right means for measuring.

In manufacturing, this measuring unit is the cost estimate, to which the actual performance must be compared. So the cost estimate must be painstakingly exact, as, even with the greatest care, it is but an estimate based on past performances and future assumptions. Right here a circle is moving within a circle. A proper cost system is essential to provide dependable data for future cost estimation, and it is also essential to check present performances to insure that they are within the possible proximity of the estimate.

A cost estimate is too important to be based on individual skill and opinion, since it is the measure to which future performances will be compared. Its form must be detailed enough to permit comparison of each factor at any time during production, and it should show all factors of the articles under construction. It should be a master record, arranged in such a manner that any person trained in the manufacture of the article will be able to gain sufficient information for its duplication, or judge from the estimated cost factors whether its duplication is within his ability.

During the course of a year many mills change superintendents or other executive heads, and in numerous instances such changes are accompanied by considerable loss to the mill until the new head is able to "pick up the ends" and familiarize himself with the details of the business. The injustice suffered by many capable men as a result of the lack of proper and compact information could be better told by the victims themselves. This can be eliminated if the proper estimates and details are developed in a tangible manner and concentrated in one record for each article.

The illustration (Form 5) shows an estimate form con-

structed with such a purpose in mind, which will also serve the purpose of an index in the discussion of the cost factors and their relations to each other.

The upper part of the form is arranged for all technical information referring to the production of the article, while the second section gives in detail the material, waste, and the cost of materials. The third section accounts for all direct labor and its proportionate burden, divided departmentally; while the last section covers the general and special items of cost allotted to the product as a unit.

ARTICLE Barracouting, 36 inch, 2 ply

COLOR		SELVAGE WEF		WARP LENGTH	
FINISH		REED		WARP LENGTH	
WARP PER IN		REED WIDTH		LOOM LENGTH	
PICKS PER IN		LOOM WIDTH		DRAWING IN	
SELVAGE		WEAVE		FILLING COUNT	
WARP SIZE YDS PER LB		WARP BLEND		WARP WEIGHT	
WARP SIZE YDS PER LB		WARP BLEND		WARP WEIGHT	
FILLING SIZE YDS PER LB		FILLING BLEND		FILLING WEF	
FILLING SIZE YDS PER LB		FILLING BLEND		FILLING WEF	

WARP (ENDS)×(WARP LENGTH)÷36×(YDS)÷(YDS/LB) = LBS @	
WARP WASTE ..... %	
WARP (ENDS)×(WARP LENGTH)÷36×(YDS)÷(YDS/LB) = LBS @	
WARP WASTE ..... %	
SELVAGE	
FILLING (PICKS PER IN)×(REED WIDTH)×(LOOM LENGTH)÷36÷(YDS/LB) = LBS @	
FILLING WASTE ..... %	
FILLING (PICKS PER IN)×(REED WIDTH)×(LOOM LENGTH)÷36÷(YDS/LB) = LBS @	
FILLING WASTE ..... %	
COST OF MATERIALS	$
DRESSING LABOR	
DRESSING BURDEN	
QUILLING LABOR	
QUILLING BURDEN	
WEAVING LABOR	
WEAVING BURDEN	
MENDING LABOR	
MENDING BURDEN	
FINISHING LABOR	
FINISHING BURDEN	
COST OF LABOR AND BURDEN	
GENERAL BURDEN AND PROFIT	
BOXING AND PACKING	
FREIGHT AND INSURANCE	
SELLING BURDEN	
PER CENT DISCOUNT	
PER CENT SELLING COMMISSION	
TOTAL COST	
SELLING PRICE	

Form 5. Form of Cost Estimate

Now we can assume a change has been made in the wording of this form to suit it to any other line of goods, disregarding the headings and technicalities and discuss raw materials—the most important item of almost every textile product.

Everything that goes into the making of an article is classed as material, but there are hundreds of small items which, though entering into the article, cannot be considered as material; oil, for instance, is necessary for lubricating purposes is considered a

supply, not a material. The division between materials and supplies is but a hair line, and, therefore, if a uniform rule providing that all raw materials visible in the finished article be regarded as material, and everything else used in the manufacturing process, but invisible in the finished article, be considered as supplies, this would do away with the confusion as to these two factors.

A cotton yarn mill considers cotton as its raw material; a grey goods mill selling to converters considers its yarn and sizing as raw materials; while a finishing and dyeing establishment, its chemicals, dyes, wrappings and tags. An underwear mill making its own yarn should consider as raw materials—cotton, wool or silk, dyes, chemicals, sewing thread, buttons, tags, boxes, labels and twines.

Material is the thing upon which the existence of an article will depend. A slight mistake in the estimate of the raw material may prove fatal to the mill. A mistake in the other cost factors is reparable in many instances, but a mistake in materials can seldom be rectified. Unquestionably, the successful buyer of materials is a long lap in advance of less skilful competitors; so is the successful manager who keeps watchful eyes over his materials, either in stock or in process, and has his control system balanced delicately enough to show the slightest variation in the use or misuse of materials. His available records for future cost control must be complete enough to reduce the possibility of mistake in his material estimations to the minimum.

A rigid control of materials for all branches of the textile industry cannot be emphasized too strongly. Flax, cotton, wool and silk all possess high hygroscopic characteristics. The invisible losses of materials, a nightmare of every mill man, are ever present, even under the most painstaking control. The selfsame lot of material will show puzzling differences in weight on two consecutive days, and thus all experience will

prove insufficient to explain them unless proper records are at disposal to detect the real cause of a shrinkage or mysterious gain. Human nature is too apt to move in the direction of least resistance and when control of material is lacking, human shortcoming, negligence and incompetence are often charged into the mysterious workings of the humidity.

If the history of dishonest and fraudulent practices in textile mills were ever written, frauds in connection with materials would occupy nearly all the volume. Since mill organization and control must prevent opportunities for the dishonest practices of individuals, who in spite of the greatest care in selection may find their way into any organization, the control of materials must be rigid. Most cases of fraud with which the writer has come in contact have been traced back to slack control methods on the part of the mills, who were the victims of their own negligence.

Summing up all reasonable arguments, the control of materials in a modern mill is essential, and the methods of the control should be extensive enough to limit the possibility of mistakes, misuses and frauds, while they must be complete enough to serve as a dependable guide for future estimates and comparisons of cost.

If this is the case, then all cost estimates, or the measure of all comparisons, must be worked out to a sensitive balance and the actual performances compared in practical units. There is no hard and fast rule as to what this unit of comparison should be. The value of the raw materials, their characteristics and the processes of manufacture will in each instance suggest what multiple of the cost estimate unit should be the measure, during which processes and by what means.

A maker of jute bagging will probably find ten thousand pounds the right measure of comparison, while in silk throwing even a hundred pounds is often too high. A maker of low grade woolens will find it sufficient to compare his filling waste

in weekly time units of groups of four or eight machines, while for print cloth a report for a group of twenty-five machines will be the most convenient. The same principle holds true in determining the best unit for cost estimations. Cheap underwear sold to jobbers only in case lots should have a case as its cost unit against a dozen unit for the combed Egyptian article.

This is the psychology of the control of raw materials today. The principle adopted for the successful technical organization of a mill holds good in every sense for the cost control organization. During the discussion of all phases of material control, numerous methods and means will be presented, but before deciding on any particular method it will be worth while to remember the motto of every good mechanic—"Select the right tools for the right purpose."

CHAPTER III

LABOR

Let us glance again for a moment upon the unit measure of all our future operations,—the cost estimate,—the division after material accounts for the important item of labor. This is arranged departmentally with its proper share of burden or, in other words, the departmental operating expense.

The illustrated form of the cost estimate has not been arranged to fit individual temperament; its consequent form closely follows the psychology of buying and selling, to which every operator in merchandise adheres, consciously or unconsciously. If a picture could be drawn of the mental process of a buyer, only two factors of the cost would be visible—the raw materials and the labor attached thereto. The mind of the buyer of cloth at the moment of bargaining will reflect a bale of cotton, the spinner, the weaver, the wrapping, twine, shipping case and the freight train forwarding the goods. The machinery, investment, depreciation, power and the cost of managing personnel will never enter into his picture.

Let our force of psychologists wrangle over this phenomenon, the probable cause of which is the fact that modern industry is yet but two centuries young and we find it difficult to overcome the thousands of years of exclusive association with these two factors. The buyer is willing to concede the increased value of a product through the addition of human labor, even if this means nothing more than serving an ingenious machine. In spite of all human endeavorings to refine

a product and make it more suitable for the purpose, he is willing to consider the increased cost only when it is *visible in the product itself,* and then *only in the terms of human labor.*

This strange twist of human nature is responsible for a very important classification of labor in cost control organization. We divide labor into two kinds;—first, the labor that has a *direct* influence on the *visible* increase in the value of a product, calling this *Direct Labor* or *Productive Labor;* secondly, the other kind, which, while absolutely essential, is at the same time *invisible* in the product and so would not prompt the buyer to pay a higher price. But, nevertheless, the latter must be included *indirectly* in the cost of the article. This labor is called *Indirect Labor* or *Nonproductive Labor,* and will be taken care of in the Burden, a cost item to be discussed in the chapter which follows.

It must be left to individual judgment to distinguish the Direct from the Indirect Labor in each case of control organization, but a suggestion will be worth while. In case of doubt, one should ask himself whether the particular item of labor cost would prove of sufficient appeal to the buyer to induce him to pay a higher price. Based on the above definition, for instance, inspection labor is Direct Labor because it prevents the shipment of imperfect merchandise, thus increasing the value of the product. The result is visible. An overseer, a machine fixer, or a sweeper is Indirect labor, as no buyer is willing to pay more on account of control, perfect machines or clean floors, so they will be captioned under Burden.

We will dispose temporarily with Indirect Labor and proceed with a close scrutiny of Direct Labor; examine its characteristics and determine the best methods of control, measurement and distribution as a cost factor.

Direct labor is the most uncertain and capricious factor of the cost element. It is the hardest to estimate and its close

determination is extremely important, since it is the *only constant* upon which Burden distribution can be based. Direct Labor Cost or Machine Hour Cost is the measure of the Burden.

The best method of labor compensation is still the subject of feverish search by our economists and engineers. While a machine's efficiency is almost constant, and its productivity in most instances depends on human assistance only in serving capacity, its actual productive efficiency can be measured only in the terms of human skill, which varies in each individual. At best all we have to guide us are averages.

To overcome this fluctuation and simplify control wherever possible, piece rates have been introduced. On the surface, this form of labor compensation will do away with troublesome computations and keep the direct labor charges constant. Many industries will admirably lend themselves to this form, but unfortunately the textile industry as a whole cannot be counted among them. Piece rate by its nature is a non-elastic form of payment. It presumes only unimportant irregularities in the quality of the materials; otherwise the rate will be either too high or too low. In the textile industry, where the speed of production is never constant because of its peculiar susceptibility to variation, piece rates must be augmented with special provisions and extra allowances, and this is sufficient to entirely destroy the constancy of the piece rate method. The frequency of a less than average quality stock and its influence over all operations need no further discussion.

So the direct labor charges for each operation of an article cannot be obtained by looking up the piece rate tables, but for each rate the variable cost of labor caused through irregularities must be computed and added to or deducted from the unit of production. Otherwise the measure will be untrue and, consequently, so will the Burden based on it.

The labor control records of a mill, therefore, must show

the frequency of such irregularities to make possible an intelligent remedy and to distribute any excess direct labor in the right proportion at the right place.

For many labor performances (such as dyeing, inspecting or mending) piece rates are not applicable. The labor charges here must be arranged for distribution over the various articles in terms of time, changed to money values and charged to production cost of each article in right proportion. The task appears complicated but, as it will be seen during the organization of the control records, it can be mastered without red tape.

We end the discussion of Direct Labor by summing up the requirements. The unit measure of any factor of cost must be painstakingly exact, otherwise its Burden will be out of proportion. Labor being an inconstant factor, the control records must faithfully reflect the variations, otherwise the curbing of the irregularities cannot be successfully attempted by the management.

CHAPTER IV

THE BURDEN OF THE PRODUCT

Take a trip through the factory. In the inner office the treasurer is just signing a batch of checks. Outside, the bookkeeper is balancing the accounts. We pass a handful of clerks and stenographers, all earning wages and using stationery, for which the treasurer just signed the check. The office boy is putting stamps on a stack of mail. Going to the mill, we meet the superintendent and are almost run over by the truck delivering shipments from the depot. Inside the mill everybody is hustling. The foreman is absorbed in examining a sample and we just passed the machine fixer sitting on the floor changing a broken gear. Yonder a woman cleans windows, and we make way for a truck taking goods to another department, pushed by a husky fellow. The foreman's assistant is standing before his supply closet handing a new broom to a boy. We peek into the closet and wonder at the sandpaper, tacks, beltings and the other hundred articles we observe. We pass the running machines and turn into another department, where the steam used for some purpose is so heavy that even the fans can hardly drive out the fog, so that lights are burning to dispel the darkness. Here the overseer just discharged a worker because he spoiled a piece of product and is now hurrying to the machine shop with a broken casting. We get into the engine room, and the engineer reminds us that the boiler house needs a new roof. We glance into the boiler house and the heat of burning coal penetrates even our clothes.

Let us go back to the office and decide the best way to charge all these things we have seen to the yard of cloth, or the dozen stockings, or whatever may be the unit of production.

Under burden it is customary to charge everything that does not fit into material and direct labor. Unfortunately, the theory of burden and its distribution is very little known to the average manufacturer and mill accountant, the result being that almost every mill "has its own way." Maybe it is a broad statement, but nevertheless it is a true one, that there is only one proper way in which to classify and distribute burden, and any accounting system that does not strictly adhere to this law is in every instance endangering the expected profit, and in many cases the future success and existence of the establishment.

Burden does not recognize such divisions as "incidentals," for there are no incidentals in manufacturing; all unexpected expenditures will come under one of the cost factors.

The greatest difficulty textile manufacturers experience with burden is in its proper division. At first it seems complicated, but it is quite simple after careful study. In the construction of a cost control system one should disregard the difficulties connected with distribution and put all efforts into classification. When the various factors are properly placed, a method of distribution will automatically suggest itself.

The proper control of the large number of burden factors, after a close examination, will require a triple division:

Manufacturing Burden which will carry in some form all charges not included in Material or Direct Labor, but necessary for manufacturing.

General Burden covering charges of nondescript character, essential but having no direct relation to either manufacturing or selling.

Selling Burden where all expenditures connected with the selling of the product are accounted for.

Before going into the discussion of the various burdens, one important problem will need attention; that is, the method of burden distribution.

Consider for a moment your raw material and the finished product. From a bale of cotton to a hank of yarn, from the yarn to the fabric, from the fabric to the finished article,—in each instance the Productive Labor caused the value increase. So it is rational that Productive Labor should carry the Burden.

In spite of the clearness of this argument, the number of mills using other methods because they seem simpler is surprisingly large. So it will be worth while to look into this problem in a manner that will need no further argument.

TABLE AND CHART OF BURDEN DISTRIBUTION

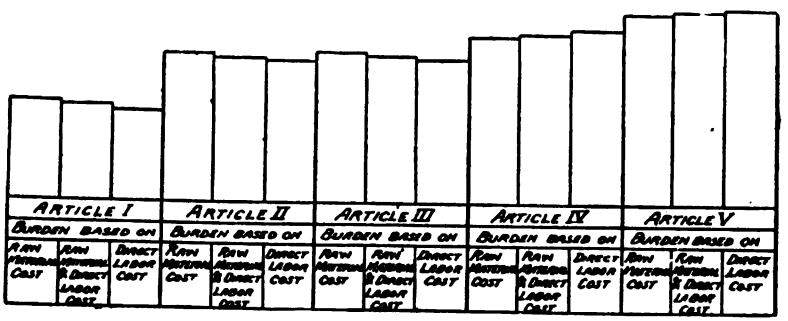


Table A—Table of Burden Distribution

	Article I.	Article II.	Article III.	Article IV.	Article V.
Quality, lbs.	1000	500	700	300	1000
Cost of raw material per unit	65	87	89	91	105
Direct labor per unit, Department A	3	3	3	4	4
Direct labor per unit, Department B	4	5	4	8	8
Direct labor per unit, Department C	6	7	7	11	13
Direct labor per unit, Department D	3	3	5	9	11
Direct labor per unit, Department E	7	9	8	9	9
Total direct labor per unit	23	27	27	41	45
Total direct labor per quantity	230	135	189	123	450
Total raw material cost per quantity	650	435	623	273	1050
Direct labor plus material cost per quantity	880	670	812	396	1500
Direct labor plus material cost per unit	.88	1.14	1.16	1.32	1.50

Total cost of Raw Material	$3,031.00	which is 33.5 per cent. of raw material
Total cost of Direct labor	1,127.00	which is 90. per cent. of direct labor
Total cost of Burden	1,014.30	which is 24.4 per cent. of raw material and direct labor
Total	$5,172.30	

Table B—Burden Distribution Based on the Value of Raw Material

	Article I.	Article II.	Article III.	Article IV.	Article V.
Cost of material	650	435	623	273	1050
Direct labor	230	135	189	123	450
Burden (33.5 per cent. of material)	217.54	145.58	208.50	91.36	351.32
Total cost per quantity	1097.54	715.58	1020.50	487.36	1851.32
Total manufacturing cost per unit	1.0975	1.4312	1.4578	1.6245	1.8513

Total cost $5,172.30

Table C—Burden Distribution Based on the Value of Raw Material and Direct Labor

	Article I.	Article II.	Article III.	Article IV.	Article V.
Cost of material	650	435	623	273	1050
Direct labor	230	135	189	123	450
Material plus direct labor	880	570	812	396	1500
Burden (24.4 per cent.) of material and direct labor	214.67	139.05	198.08	96.50	365.91
Total manufacturing cost per quantity	1094.67	709.05	1010.08	492.59	1865.91
Total manufacturing cost per unit	1.0947	1.4181	1.4429	1.6416	1.8659

Total cost $5,172.30.

Table D—Burden Distribution Based on Direct Labor

	Article I.	Article II.	Article III.	Article IV.	Article V.
Cost of material	650	435	623	273	1050
Direct Labor	230	135	189	123	450
Burden (90 per cent. of direct labor)	207	121.50	170.10	110.70	405
Total manufacturing cost per quantity	1087	691.50	982.10	506.70	1905
Total manufacturing cost per unit	1.087	1.383	1.403	1.689	1.905

Total cost $5,172.30

Table E—Comparison of Total Manufacturing Cost Derived from Various Methods of Computation

Burden based on—	Article I.	Article II.	Article III.	Article IV.	Article V.
Cost of material per unit	1.0975	1.4312	1.4578	1.6245	1.8513
Material plus direct labor per unit	1.0947	1.4181	1.4429	1.6416	1.8659
Direct labor per unit	1.087	1.383	1.403	1.689	1.905

The grand total of manufacturing cost is in each case $5,172.30, a proof that the distribution is correct. Yet what a serious difference of unit costs of the same article; depending entirely upon the method on which the burden has been distributed. The difference is even more startling in the accompanying Chart.

Form 6. Table and Chart of Burden Distribution

The tables and chart (Form 6) might represent anything from cotton print cloth to heavy duck, from carded peeler yarn to silk warps, from shoddy overcoatings to the finest broadcloth; hosiery, sweaters, underwear, braids, shoe laces, or any other product. The result would be the same. Prove it to

yourself by working it out for your special case and stop wondering why last season you could not meet the market on certain articles because a competing mill offered the same underwear for 30c a dozen less, or a suiting for 5c lower, or you lost a converter's contract because someone underbid you five points. Stop wondering and make a resolution instead to support the association to which you belong in developing a uniform cost accounting system for each line to be used by every member of the association. Then competition will be what it should be; fair and based on merits instead of unfairly based on accident or the whim of distribution of burden.

A close examination of the chart will give the proper distribution of burden. It will be noticed that on the lower cost articles the price is highest when burden is based on raw material, the lowest when burden is based on direct labor. With the two highest priced articles just the reverse is the result; total cost is highest when based on direct labor. Every manufacturer will agree that a higher priced article should carry a greater share of burden, and a lower priced article a smaller share. The burden distribution should be based on the direct labor expended on an article, because the value of an article varies in proportion to the direct labor put into it.

To test this statement take yarn manufacturing—a low middling cotton or a cheap grade of wool will limit the size of the yarn. From such raw material a cheap article is produced. From the same raw material may be produced four or five sizes of yarn. A higher price is demanded and obtained for the fine numbers than for the coarse ones. The raw material is the same, but the direct labor is more, hence the higher price. More direct labor means that the production required a greater number of workers to carry on production, or a smaller production by the same number of operatives.

A glance at the factors of burden will tell that ninety per cent of its constituents are necessary to handle and control

production and not material. The superintendent, overseers, section hands, motive power, light, heat, insurance, most of the clerical force, handle production. The same space will store one bale of shoddy or one bale of fine wool. The same loom will make a cloth of both, and the production may be five times less for the fine article than for the cheap article. Power will be five times as much; so will the loom's share of depreciation, rental, overseeing, supplies, etc. This is an extreme illustration, but it contains the truth. So it is direct labor that determines the proportion of burden, as direct labor is always in proportion to the selling price. Burden that refers exclusively to material, as storeroom, rent and handling, is but a small part of the total burden and can be safely lumped with the rest.

Another important side of burden distribution is that the proportion planned in cost figuring when approaching the market with the season's samples should be maintained throughout the season.

Another form of this method is the distribution by production hours, which is nothing but direct labor in the form of time consumed. Assume that the total time of direct labor for a month amounts to 9,392 hours and the total burden for this period is $1,014, then the burden share for each prductive hour is 10.8c. To produce 1,000 units of an article requires 1,750 productive labor hours; the burden being 10.8c per productive labor hour the total burden will amount to 1,750 x 10.8 = $189.

There is still another method of figuring burden, wrong in principle and a danger to profit, known as the distribution by unit production. It is surprising what a number of mills use this method today in spite of the fact that it has been condemned and branded as a ruinous practice. For instance, suppose that a yearly production is 100,000 dozen hose in three grades, selling at $1.75, $2 and $3, respectively. The

total burden for the last year amounted to $21,000; then, according to this fallacy, 21c will represent the burden per dozen. Manufacturers who are satised with this sort of cost accounting will usually find the profit item at the end of the year a keen disappointment, even if the mill was filled up with orders. But how could it be different; the goods on which the business was done are usually the ones where the burden added was lower than the right proportion and the difference has to come from the anticipated profits.

The next problem confronting us is the classification of the various burdens in their right location. We already know that our burden will have three main divisions—Manufacturing, General and Selling.

Manufacturing Burden will be subdivided again into—

1. Indirect Labor
2. Supplies
3. Power, Light and Heat
4. Rent, Insurance and Taxes
5. Depreciation of Machinery and Equipment
6. Maintenance of Machinery

The distribution of this combined burden in one lump sum to the total direct labor is possible; however, the mill must be a very small one, where the details of the departmental burden are of no special interest to the management. As the divisions of the operations naturally break up a mill into various departments, so the burden should follow this division. A modern cost control system is incomplete unless it supplies detailed data of cost and operations and, under the discussion of the control methods, ample proofs will be cited to swing even the sceptical in favor of such departmental divisions. This will mean that all manufacturing burden expenses will be charged directly to the departments responsible for them, and that every unit of direct labor of a department will have to carry its proportionate burden.

The procedure of classification is simple, and it will be discussed together with the factors of this burden.

Indirect Labor

We defined direct labor as the part of human endeavor contributing to the increased value of the article. So indirect labor must include everyone else on the manufacturing payroll. To simplify the method of distribution under the proper chapter, the payroll construction will be discussed and forms presented illustrating how this can be obtained by a direct method. Purely departmental help, of course, will be charged to its respective department; so in the weave shed, for instance, the foreman, assistant foreman, loom-fixers, filling carriers and other help will be charged direct. Oilers and other employes, whose duties are divided among several departments, will have their time divided on some basis suitable for distribution. This also refers to overseers having several departments under their charge. In the case of an oiler, for instance, the proportion of shafting in the various departments offers a natural solution, and it will not be necessary to use hair splitting methods in the division. The opinion of the superintendent is usually quite sufficient in such cases. With the aid of a well arranged payroll, such distribution will consume hardly more time than the ordinary method, the only requirement being that the duties of each employe be gone over carefully and placed under the proper division.

Supplies

The proper distribution of supplies should be of the greatest concern to a manufacturer. They usually include everything from brooms to leather strips. It should be first determined in what proportion these supplies are used, not only to give a basis for departmental cost, but also to supply de-

pendable data for the control of the supplies. As some mills carry several hundred items in their stock supply it is a popular opinion that any thorough method of stock accounting would require so much labor and expense as to make it impracticable. But if supply accounts are properly constructed, the allotment of supplies requires hardly more labor than the customary haphazard ways. A well run supply department also has a very important moral effect. Carelessness and improvident use of materials cannot be checked by words; a certain moral pressure is necessary. It has been proven in many instances that departments will take greater care in using supplies if they know that all items are carefully recorded and charged to their account. There is always a shortage or overflow of certain supplies where this is not done.

Power, Light and Heat

The control and distribution of Indirect Labor and Supply factors will form almost in every instance an individual unit charge under some suitable method. A short discussion as to their nature and characteristics is quite sufficient under this Burden chapter. Not so with the remaining factors, of which Power, Light and Heat are the most important. Ahead of us now are a pile of coal, a battery of generating machinery, motors, transmission carrying this fluid of mechanical life into all directions of the mill to machines of various power consumption, friction and loss of energy, varying as to distance, load or resistance. To obtain the right proportion of power consumed by each in a manner that is better than a rough guess seems an impossibility. The application of laboratory pull tests would be a tedious and hopeless task with results hardly more accurate than the blind estimate. Some means must be found to determine the right proportion of power consumption in each department, which is simple, less tedious and at the

same time dependable enough to form the basis of our distribution.

In all probability one of the following conditions will be found in the mill:

1. Electric motive power is purchased from the outside.
2. Electric motive power is generated by the mill.
3. Steam power and electric light are generated by the mill.
4. Steam power generated by the mill, electric light purchased outside.
5. Steam power generated by the mill, electric power and light purchased outside.

In each instance the steam for heating or manufacturing purposes is presumed to be made by the mill.

Let us examine the possibilities for simplified procedure in each case:

The most desirable and by all means the most advisable arrangement is the installation of an independent meter for each manufacturing department. The investment will be worth while. The current consumption is under constant control, and the department's power and light burden is obtained directly.

If this is impossible, the installation of an independent meter on each floor is the next best proposition. In this case the power must be divided among the departments under the common meter, in a manner to be illustrated in the next case.

Under the most unfavorable conditions, the mill must possess one meter for the measurement of the current consumption of the mill, and it will be necessary either to obtain the power and light share of the various departments by mathematical computation or by trial runs. They are both somewhat tedious and it will be left to the personal choice of the management to decide on either of these two methods.

The Procedure for Mathematical Computation

An inventory is made of all motors in each department; their inventory number and purpose designated with a letter, also the Horse-Power capacity. This data is arranged departmentally, under the headings of—

Machine Number
Size of Motor
Capacity Used
K.W. Units
Deduction from Full Load
K.W. Consumed
K.W.H. per Month

Under this mode of calculation it will be essential to estimate the capacity or load of the motor, also the deductions from full load, based upon the time the motor is actually working. It has been found that the combined judgment of the superintendent, engineer and departmental foreman will be very close to the actual conditions and can be accepted as dependable. Remembering that one horsepower is equal to .746 K.W. Units, the rest of the table is but a simple computation. The percentage relation of the departmental totals to the grand total will now be the base of distribution of the power burden. However, there are a number of side issues that need consideration. In many mills certain machines find only seasonable use; also the installation of new machinery will change the established quota. Such new equipment will have to be added, while the increase of power consumption by a department will surely show in the increased total consumption, and it will not be difficult for a management to trace the increase to the right department to correct the quota of power burden. A table of power distribution developed according to the above method is shown in illustration (Form 7).

Table of Power Distribution

Machine No.	Size of Motor		Capacity Used	K.W. Units	Deductions from Full Load	K.W. Consumed	K.W.H. per Month (230 K.W.H.)	Totals
				Department A				
C-11	3.	H.P.	Full	2.24	25%	1.68	386.4	
S-23	3.	H.P.	Full	2.24	25%	1.68	386.4	
B-19	10.	H.P.	Full	7.46	25%	5.585	1,284.55	
								2,057.35
				Department B				
Line Shaft	15.	H.P.	10 H.P.	7.46	50%	3.73	857.9	
								857.90
				Department C				
C-34	5.	H.P.	2 H.P.	1.492		1.492	343.16	
C-17	5.	H.P.	2 H.P.	1.492		1.492	343.16	
C-61	2.	H.P.	1 H.P.	.746	75%	.165	38.	
C-62	5.	H.P.	2 H.P.	1.492	50%	.746	171.58	
								895.90
				Department D				
C-3	2.	H.P.	Full	1.492	25%	1.119	257.37	
C-32	2.	H.P.	Full	1.492	25%	1.119	257.37	
C-53	2.	H.P.	Full	1.492	25%	1.119	257.37	
C-60	1.	H.P.	Full	.746	25%	.5595	128.69	
C-12	.5	H.P.	Full	.373	10%	.3357	77.21	
C-58	3.	H.P.	Full	2.24	25%	1.68	386.40	
C-57	3.	H.P.	Full	2.24	25%	1.68	386.40	
C-2	3.	H.P.	Full	2.24	25%	1.68	386.40	
C-1	3.	H.P.	Full	2.24	25%	1.68	386.40	
								2,523.61
				Department E				
F-2	.125	H.P.	Full	.0933	25%	.0699	16.08	
F-7	.625	H.P.	Full	.466	10%	.4194	96.46	
F-9	1.5	H.P.	Full	1.12	25%	.84	193.20	
F-8	2.	H.P.	Full	1.492	25%	1.119	257.37	
F-91	.5	H.P.	Full	.373	40%	.2238	51.47	
F-94	1.25	H.P.	Full	.933	25%	.699	160.77	
F-92	1.25	H.P.	Full	.933	50%	.467	107.41	
F-20	5.	H.P.	Full	3.73	50%	1.865	428.95	
F-21	5.	H.P.	Full	3.73	50%	1.865	428.95	
F-93	2.5	H.P.	Full	1.87	10%	1.683	387.07	
F-14	.625	H.P.	Full	.466	25%	.3492	81.34	
								2,209.07
				Department F				
Line Drive	3.	H.P.	Full	2.24		2.24	515.	
G-3	3.	H.P.	Full	2.24	70%	.672	154.56	
								669.56
Total Monthly Power Index K.W.H.....								9,213.39

Form 7

For light burden item the procedure is similar (Form 8), and the data is arranged departmentally as follows:

Number of Lights and Fans
Capacity
K.W. Units
Deduction from Full Load
K.W. Consumed
K.W.H. per Month

Now we have for power and light two dependable tables for distribution as well as for the control of power consumption. Should the monthly power bill increase or decrease, the

TABLE OF LIGHT DISTRIBUTION

No. of Lights and Fans	Capacity	K.W. Units	Total K.W.	Deduction from Full Load	K.W. Consumed	K.W.H. per Month (230 K.W.H.)	Totals
			Department A				
4	100 Watt	.1	.4	50%	.2	46.	46.
			Department B				
4	100 Watt	.1	.4		.4	92.	
8	25 Watt	.025	.2	50%	.1	23.	115.
			Department C				
20	100 Watt	.1	2.	75%	.5	115.	
3	25 Watt	.025	.075		.075	17.25	132.25
			Department D				
14	25 Watt	.025	.350		.35	80.50	
11	100 Watt	.1	1.1	60%	.44	101.20	
4	60 Watt	.06	.24	60%	.096	22.08	203.78
			Department E				
15	100 Watt	.1	1.5	70%	.45	103.50	
3	25 Watt	.025	.075	70%	.0225	5.17	
1 Fan	.75 H.P.	.56	.561		.56	128.80	
3 Fans	.25 H.P.	.187	.561	75%	.14	32.20	269.67
			Department F				
16	100 Watt	.1	1.6	50%	.8	184.	184.00
			Store House				
12	25 Watt	.025	.3	25%	.225	51.75	51.75
			Stock Room				
3	25 Watt	.025	.075	25%	.05625	12.94	12.94
			Shipping Room				
10	100 Watt	.1	1.	75%	.25	57.50	
1	35 Watt	.035	.035	75%	.00875	2.02	
3	25 Watt	.025	.075	75%	.01875	4.31	63.83
			Office				
6	100 Watt	.1	.6	75%	.15	34.50	
2	25 Watt	.025	.05	75%	.0125	2.88	
3 Fans	.1225 H.P.	.0935	.281	75%	.07	16.10	53.48
Total Monthly Light Index K.W.H.							1,132.70

Form 8

comparison with the index will always give definite information as to the difference. The condition in the plant will at the same time tell whether the increase was justified on account of increased use of machines or whether some form of misuse

of power was responsible. As far as the total consumption goes, the bill for the month will itself furnish the information. But such increases are seldom due to power abuse, and most likely an increased use in a department is responsible, in which case the difference between the index and the actual consumption will be charged to the respective departments responsible, and if such increases become permanent the percentage power or light charge is corrected. There is no better control instrument for the manager of a mill using electric power than such index tables. If bought outside, the monthly bill; if generated home, the monthly sum of the daily Watt Hour readings compared with the index tables affords a perfect control.

The total monthly consumption in these tables is based on ten hours a day with Saturday half holidays, making a total of 230 monthly hours; and for actual development, the number of hours adopted by the mill should be used. A twenty-third of each departmental total in these illustrations represents the daily consumption, or if certain departments work more or less hours the difference can be added or deducted from the department on a percentage basis. In the same way the power consumption of night work can be closely estimated.

There is a very meager possibility of mistakes in the development of the index tables. The total power consumed must be in close proximity to the actual, indicated in the bill or the monthly Watt Hour readings. A difference of five per cent in the totals can be disregarded; a greater difference, however, will necessitate a revision of the departmental proportions of the tables, and there is no instance where a mistake under or over could not be detected and corrected.

It is true that the development of such tables is painstaking work requiring time and care, but it should be remembered that such work is essential only once, and the management has a dependable instrument in hand without which proper control of cost is unimaginable.

From the two previous tables, Djstribution Tables can be prepared (Form 9) to be used for the monthly distributions. If power and light are purchased outside, the rate for light and power will be different, and even if electricity is generated at the mill, the lines of power and light are independent and measured separately. So the Distribution Table will account independently for these two departmental burden factors.

This is the procedure of dependable power and light burden distribution. If this base is correct, the variations ex-

MONTHLY PERCENTAGE DISTRIBUTION TABLE OF POWER AND LIGHT

Department	Power Index	Power % of Distribution	Light Index	Light % of Distribution
A	2,057.35	23%	46.	4%
B	857.90	9%	115.	10%
C	895.90	10%	132.25	12%
D	2,523.61	27%	203.78	18%
E	2,209.07	24%	269.67	24%
F	669.56	7%	184.	16%
Store House			51.75	4%
Stock Room			12.94	1%
Shipping Room			63.83	6%
Office			53.48	5%
Totals	9,213.39	100%	1,132.70	100%

Form 9

pected every month, through additions, shut-downs and overtime, can be easily taken care of.

There is another way of obtaining the above results, if electricity is the power. This is the direct test method. The procedure is simple and requires considerably less mathematical computation, but unless extreme care is taken that during the tests the running machines represent average conditions, the results will be disappointing. This method is more suit-

able for machine shops and kindred industries than for textile plants.

The procedure consists of running a department independently every day for an hour or two overtime, reading the meter before and after the test. The difference, of course, will be power consumed. But let me again inject the warning to be sure that during the test the department represents the normal conditions. It is also advisable to repeat the test to check accuracy. Where overtime is inconvenient, the test can be made at noon hour when the other departments are shut down. This test also requires time, and if the number of departments is large it may take a month. Nor can the tests be made without inconvenience, which will surely have an effect on the production of the mill.

For the other two possible forms of power, namely, steam or water, the power calculations are more cumbersome. With these two motives, the only practical solution on hand is the estimate. The procedure is similar to the previous one, the only difference being that the power is expressed directly in horse-power. In case of doubt, the makers of the various machines can supply the information, while for frictional and transmissional wastes the judgment of some expert mechanic or engineer is the most advisable. Calculations of this kind involve such a number of complicated formulas and the chances for mistakes are so great that it is not worth while, especially as there is hardly a mill organization where the judgment of the management or department heads is not competent enough to estimate the individual units sufficiently close for the burden factor.

This completes the discussion on power and light burden distribution. The control of the power department itself is an organization problem and will be taken care of in its right section.

The next item of consideration is heat. Properly stated

it is heat, steam and humidification. During the last few years, with the advance of scientific management, indirect heating and humidification made sufficient progress to necessitate a radical change in the cost control system. Where such methods are used, heating becomes a mechanical operation, the cost of which the various departments will share in proportion to their cubic air contents.

When direct or radiating heating system is in use, the departments should be charged in proportion to the feet of piping in each department. If the sizes of the pipes vary, one size should be adopted as a standard and for the others corrections should be made according to the relation of their size to this adopted standard. The heat required will, of course, vary with the location of the mill. These charges will not exist in summer time. This factor of cost is only added when actually used, that is,—during the winter months.

Heat and steam used in drying, finishing and dyeing processes have to be accounted for constantly, and a Distribution Table prepared similar to that for power and light. The quantity of steam and heat used in the various machines must be changed over to horse-power values, and such hourly factor can be obtained from the makers of the respective machines.

Live steam used in dye houses and finishing rooms for water heating purposes must be estimated. A mathematical computation as a base is worthless, the quantity used being dependent upon the constantly varying temperature of water. The employment of one of the many steam flow measurements would be just as ridiculous and not worth the expense.

The judgment of the plant engineer is in most cases sufficient, especially since an increased coal consumption will show up at the end of the month, and if there is no increase of the power requirements this difference will be looked for in the dye house and finally the index corrected in proportion. Industrial gas used in singeing and finishing operations, of

course, will be added to the burden of the responsible department.

The Rent

Recently a mill negotiated for a loan for the purpose of erecting a new plant. "What is the matter with the old one?" asked the inquisitive banker, "Is it too small for the purpose?" "No," replied the manufacturer, "we built it thirty-five years ago, according to the style of that time. Of course, now it is cut up, dark and inconvenient. Here is the proposition. The land is now worth three times what we paid for it. My neighbors are anxious to buy it; you know they make ordnance stuff and need more space. The building itself must be pulled down. I can buy a plot to suit my purpose for half the price I will get for mine and add to it the surplus I can spare, while the fifty thousand I take from you will cover the difference."

Of course he got the money but he also got advice from his banker friend to look into his method of rent distribution.

A building is like machinery; it will depreciate. If a mill owns a building, it is more for convenience and independence than for anything else. If its cost charges account only for the conventional maintenance, repairs and interest on loan or capital invested, with an occasional "write up" after a fat year, in thirty years the management will find itself in a bad plight. A new building or radical repairs of the old building will require a deep cut into surplus or, even worse, a heavy loan.

The depreciation of a factory building is not merely physical. Improvements of building construction are still on the increase and the up-to-date mill has advantages over the one which in details has remained stationary since its erection. A factory building built thirty years ago according to the

style of its time may be in perfect physical condition today, yet it will not command the rental of a modern building.

Bearing these facts in mind, we can proceed with the development of the rent factor of the burden.

Let us take for example a newly erected plant the cost of which is divided into—

Land	$15,000
Cost of Buildings	85,000
Total Current Value	$100,000

The length of its usefulness is estimated at thirty years, with no increase in the land value. Any possible increase should be left out of present consideration.

In reality, the value of the buildings will decrease every year and, to overcome such loss on the original investment, a Depreciation Reserve Fund must be created, which will not only recompense the capital for the loss but at the same time provide a fund for the increasing expense of maintenance, and leave at the end of thirty years a reserve equal to the original investment in buildings, permitting a total rebuilding. This reserve, which must be charged yearly, should be large enough to accumulate at the end of ten years enough compound interest to permit at that time extensive alterations of the inside furnishings, such as plumbing, stairways and elevators, which in a mill depreciate at a fast rate, to put up such additions as seem necessary with the increase of business and also change detail arrangements in accordance with the latest improvements. Such things will be necessary, otherwise the original rental rate is not maintainable. The same compound interest on the reserve will be called upon to take care of the yearly small building expenses and at the end of twenty years will permit another draw on the reserve, this time greater as the changes then necessary will be more numerous. Then, besides the inside furnishings, probably the roof will need a total

reconstruction and more additions will seem advisable. Nor should it be forgotten that the original reserve fund created for the replacement of the diminishing building values must not be drawn upon but only the compound interest used. No matter how well a building is kept up, its value will depreciate yearly. In many instances the increase of land value will compensate for this loss, but this is too uncertain to be drawn into calculations and cost accounting cannot consider anything but open market values.

For the case illustrated, a 3½% charge on the original value of the buildings will replace the capital, so this will be our constant charge for the Reserve Fund for Building Depreciation. There also will be a current charge for Maintenance, which will take care of cleaning, yards, elevator service and landscape gardening, which should be done around every mill. It is estimated that such expenses will amount to $2,000 per year, so 2½% on the building investment will be charged for this purpose. There is also the charge for Interest on Capital, represented by the whole investment in land and buildings and the current expenses, such as taxes and insurance.

The rental to be charged will now be determined in the following manner:

Depreciation Reserve Fund —	3½%	on $85,000...	$2,975.00
Maintenance	2½%	on $85,000...	2,125.00
Interest on Capital	4 %	on $100,000...	4,000.00
Taxes on Land and Buildings.....			2,055.00
Fire Insurance			120.00
Total cost for the year.....			$11,275.00
Monthly charge of rental for the year.....			$939.58

All the above cost factors will have proper accounts, constituting but a simple accounting problem, needing no explanation.

Mills renting their buildings have no problem of this nature. If, besides its own buildings, the mill rents additional space, this rental must be charged to the proper departments in the right proportion. If part of the mill is rented to an outsider, this rental will be deducted from the charges.

The Distribution of Rental

Whether the mill owns the building or not, the monthly share of rental must be distributed in the right proportion among the various departments. The departments will be charged in proportion to the floor space occupied, which is most conveniently done with the aid of the floor plans of the mill, divided into departmental units and the area for each computed in square feet. Hallways, comfort places, etc., if strictly departmental, will, of course, be charged to their respective departments, while common spaces, hospital rooms, locker rooms, dining rooms, welfare club rooms, etc., will constitute a rental charge for General Burden. Many mills omit charges for the latter item altogether and divide the rent among the departments on a basis of useful space only. While this is convenient, it is questionable because the usefulness of such spaces is in proportion to employes and not to space occupied. Staircases and elevators, being paid for in rental, are left out in the rent calculations.

Under such method the rental proportions are stationary and can be read directly from the Table of Rental Distribution, but the Building and Maintenance Account is watched closely. It is advisable to have in the account of Depreciation Reserve Fund the compound interest accumulated, separated from the original fund, so that the amount available for repairs and improvements is always shown in the balance. Such reserve funds should never be invested in anything except quickly convertible assets, a sound policy followed by every conservative business.

A Table of Rental Distribution is shown in Form 10.

The rental now can be charged directly to the right burden division, and we can turn to the analysis of the next factor—Insurance.

TABLE OF RENTAL DISTRIBUTION

Department	Area in Feet	Burden %	Share of Total Amount	Charge to Monthly Burden of
L	6,545	14¼%	$133.87	Department L
M	2,505	5½%	51.67	Department M
N	3,515	7½%	70.46	Department N
O	7,645	17 %	159.69	Department O
P	7,165	16 %	150.31	Department P
R	4.725	10½%	98.63	Department R
Office	625	1¼%	11.75	Office
Shipping	1,750	4 %	37.58	Shipping
Stock Room	875	2 %	18.78	Stock Room
Store House	5,500	12 %	112.73	Store House
Engine Room	1,650	3¾%	35.23	Engine Room
Welfare	2,450	5½%	51.67	General Burden
Common Alleys	350	¾%	7.05	General Burden
Totals	45,100	100 %	$939.42	

Form 10

Insurance (with Exception of Fire Insurance) and its Relation to Burden

Let us open the safe and examine the insurance policies. There is one for fire, covering buildings, machinery and merchandise. This is already settled as we charged the whole amount to rental and distributed it among the departments. Possibly it would have been better to split it up in right proportions to building, machinery and merchandise; charge the right share to building, for machinery charge, the proper share to each department according to inventory value and charge the balance to General Burden to cover the risk of fire on merchandise. To do so would be flirting with red tape—a

thing we have tried to avoid. The amount is too insignificant to have a bearing in the final results, so why not make our work simple and presume that rental includes fire insurance. Since we have already done so, we can put this policy aside.

The next policy calls for accident, fire, etc., on the motor trucks. The trucks will have an account of their own, the total of which will find its way into the General Burden, so we can pass this over. The next policies are for life insurance of the officers of the company, another to cover financial losses, a small burglary insurance, all of which belong to General Burden and are not of interest at present. The last policy is for accident and workmen's compensation, which must be carried in proportion to the departmental payrolls, therefore a division will be necessary. This insurance, which covers all employes, is comparatively new and it will be worth while to look into it carefully.

Compensation insurance is yet in its making, and companies taking such risk are still correcting their frequency tables and changing classification. The rate, which is based on $100.00 payroll units, varies with occupation and proportionate risk. There is today a wide divergence not only between various industries but between the various occupations in each industry; for instance—

COST OF ACCIDENT INSURANCE

	Yearly Premium		Payroll
Wool Scouring, Washing and Picking.....	$1.65	per	$100.00
Wool Spinning and Weaving.....	.913	per	100.00
Shoddy Shredding	2.77	per	100.00
Cotton Spinning and Weaving.....	.759	per	100.00
Cotton Finishing	1.474	per	100.00
Office Help	.12	per	100.00

Under such conditions it is necessary to obtain from the proper source a copy of the classification, and charge the departmental accounts every month with their just share.

This being the only departmental insurance charge, we can turn to the very important item of our Departmental Burden—Depreciation on Machinery.

Depreciation on Machinery

When the Federal Trade Commission decided to investigate as to what extent manufacturers are using modern methods of cost accounting, they were very much surprised to find that "Only ten per cent of our merchants and manufacturers know the actual cost of their products, while forty per cent estimate their cost on a wrong basis, and fifty per cent have no methods whatever, but sell their goods at the price of their competitors and expect profit on their products." This statement seems unbelievable, but we have behind it the data gathered by the commission, open to any one interested. This report also states that out of 60,000 manufacturing concerns doing a yearly business of $100,000 or over, 30,000 concerns do not charge off any depreciation on their equipment.

While the whole statement is illuminating, the reference to depreciation and its utter disregard by such a large number of sound business men forcibly brings out the fact that the importance of depreciation as a cost factor is very little understood, otherwise it would not be treated with such indifference.

We have to bear two facts in mind. Machinery will depreciate, or every year will lose some of its efficiency. Its loss of efficiency will curtail profits, so the creation of a replacement fund, even if it clips today's income somewhat but insures the future high efficiency of the plant, is a sound argument. So charging to every day's production the wear and tear of operation and including it in the cost of manufacturing is good business. It is better than spasmodic slices cut from profits at the end of the year on a mere guess,—if profits are large enough.

That production causes depreciation of equipment needs

no argument. The goods produced are responsible for it just as much as they are for power or rental, so depreciation belongs to cost.

For those who are yet sceptical about this point, it will be worth while to remember that their point of view will cost them an income tax on an item of cost of production in the shape of profit. But let us consider now the fact of depreciation itself.

1. What changes of machinery construction can be expected during the coming years that will make the present equipment obsolete from the efficiency point of view?
2. What effect will the wear and tear of years have on a machine to make the replacement of parts and labor of maintenance too high for economic production?

Suppose after careful deliberation the following estimates on the useful life of machinery are found to be the most suitable for mills in the various lines:

COTTON MILL

Engine Room	25 years
Machine Shop	15 years
Opening and Picking	25 years
Carding and Drawing	20 years
Roving	20 years
Spinning and Twisting	20 years
Winding	15 years
Beaming	20 years
Slashing	25 years
Transmission, sundry equipment	20 years
Weaving	20 years

WOOLEN MILL

Engine Room	20 years
Machine Shop	15 years
Scouring, Picking	25 years
Carding	20 years

Spinning	25 years
Beaming	25 years
Weaving	20 years
Dyeing	15 years
Fulling, Washing	25 years
Finishing	20 years
Motors, and other sundry equipment	20 years

UNDERWEAR MILL

Knitting	15 years
Bleaching, Dyeing	15 years
Cutting	10 years
Sewing	15 years
Finishing	15 years

Machinery has been considered not worth keeping after 25 years' service, as no matter how simple or serviceable the machine may have been it has become obsolete; thus the equipment of any textile mill should go through a total renewal during this time. That there are many mills today where a part or all of its equipment has years ago celebrated its silver anniversary, offers no argument, and even though it is "just as good as new," it will not stand comparison with a modern machine from the viewpoint of economy and efficiency.

There should be no mill today without a detailed equipment inventory, known as the Plant Ledger, with a number for each machine, its purpose, location and price; and finally the rate of depreciation, with the amounts to be written off each year. There are various systems in use regarding the amounts to be written off. Some divide the cost of the machinery by the years determined for depreciation and apply the result as the year's charges. Others depreciate more at the beginning and less at the end of the machine's usefulness. Sometimes straight proportion is used, while in some cases even the yearly productive hours have been taken as a basis for depreciation. These are rather extreme theories, and no mistake is made by taking the simplest method of all, namely,

dividing the cost of the machine by the number of years of depreciation, the result giving the yearly charge.

The procedure for mills established many years, having machines of all values, is as follows: Make a complete card inventory of all equipment (one card for each machine), each card showing machine number, location, use and cost; the yearly amount written off and the remaining value. Assign the cards to their respective departments. Determine the present value, rate of depreciation, and extend the amount of current depreciation. Add up all current depreciation for each department, and this divided by 12 will give the monthly depreciation that is to be charged to the burden. This monthly depreciation factor is changed, if new machines are added or old ones discarded. Of course a Depreciation Reserve Account must be opened in the general ledger, subdivided for each department, and charged with the distributed monthly burden of depreciation.

Using for machine repairs these reserve funds instead of charging them to departmental expense is a good practice. A separate reserve account for each department is desirable in order to show to what extent the funds can be drawn upon for new equipment, without injustice to other departments. For example, let us assume that an old established mill has in its weave shed the following looms:

30 looms @ $150, 10 years' depreciation, yearly amount $15. Total	$450
10 looms @ $100, 5 years' depreciation, yearly amount $20. Total	200
5 looms @ $180, 15 years' depreciation, yearly amount $12. Total	60
Total yearly depreciation	$710

$710 ÷ 12 = $59.17, the amount to be charged to the weave shed's monthly burden. The monthly Depreciation Reserve will be $59.17.

The above description and example have been adopted to afford a simple illustration. In practice the problem is by no means so simple, and a carefully developed system is necessary to simplify the distribution. Mills having a thousand individual machine units are by no means exceptions, and whenever possible short cuts should be applied. The following procedure has been tested and found to answer the purpose:

First step. The complete inventory of the machinery of each department. Each machine provided with an identification number. The description must contain all technical information, origin, price, present value, estimated years of future usefulness and location.

All such information is then transferred to the individual Plant Ledger Cards, a form of which is illustrated. (Form 11.) When all items of the inventory are transferred, the ledger cards are arranged departmentally, subdivided according to machines and filed in numerical order. A Plant Ledger arranged in such a manner will always form a useful link in the control of the organization, because no matter how large the plant may be, all information referring to one particular machine, or group of machines, can be obtained quickly and, what is most important, the information will be reliable.

Second step. The information thus arranged is carefully gone over by the management, and all data referring to maker, date, purchase, cost, estimated usefulness and estimated date of discard is checked. The various department heads familiar with the machines should inspect the cards and check the correctness of descriptions. Starting the Plant Ledger for an old mill, where the machines have depreciated from their original value, the cost should always represent the original cost and the Estimated Usefulness and Estimated Date of Discard must be based on the original purchase date.

Right here we must consider the effect such systematic depreciation will have on the balance sheet of a plant where

PLANT LEDGER

Location *S-R-11*

Department: *Warping* Machine No. *16*

Machine *Righthand Warper with creel of 400 spools.*

Maker	Date	Bought From	Cost	Estimated Usefulness	Estimated Date of Discard
L. U. S.	*1910 3 15*	*L. U. S.*	*$475.00*	*20 years*	*1930*

Description	Attachments	Goods Producable
Cylinder 18 x 54¼	*Electric Stop*	*All sizes*
Beam Head 9", Barrel 26"	*Motion*	
Raising Slack roll		
6 Beams		

IMPROVEMENTS

Date	Cost	Improvement	New Value	New Estimated Usefulness	New Estimated Date of Discard
1915 7 21	*62.50*	*New Cylinder bearings*	*$418.75*	*20 years*	*1935*
				"	
				"	
				"	
				"	

DEPRECIATION

Date	Rate	Amount	Current Value	Date	Rate	Amount	Current Value
1911	*$23.75*	*$23.75*	*$451.25*				
1912	*23.75*	*23.75*	*427.50*				
1913	*23.75*	*23.75*	*403.75*				
1914	*23.75*	*23.75*	*380.00*				
1915	*23.75*	*23.75*	*356.25*				
1916	*20.94*	*20.94*	*397.81*				
1917	*20.94*	*20.94*	*376.87*				
1918	*20.94*	*20.94*	*355.93*				

Form 11. Plant Ledger

such an item has never been charged off before, or if the charges were considered too low for the amount of the machinery investment. Carrying out the method without a second thought may cause such a shrinkage in the assets of a company that a radical write-off would be dangerous. No doubt in most instances improvements have been made on the majority of equipment. Such improvements lengthen the usefulness of the machines. The procedure of such entry is clearly shown in the illustration, where the improvement increased the time of usefulness of the machine and reduced the rate of depreciation. The harm done by past neglect of depreciation cannot be righted in one stroke, unless the surplus profits are so large that a sudden write-off will have no visible influence. This condition of depreciation prompts many concerns to continue their old policy, even after the advantages of charging off have been realized. But this is unnecessary. The rate of depreciation is based on accepted standards, and starting this system with the original purchase price but with the rate of depreciation commencing today *is better than letting things slide on in the old way, because every year the mill will have some definite sum at its disposal with which to renew a part of the equipment, and this will not come from the profits, if there are any, but will have been already included where it belonged—in the cost—and paid for in the selling price.*

Third step. The cards are now ready for the accounting department, and the remaining extension is but simple clerical work. The last entry of value divided by the last entry of years of usefulness will be the rate of depreciation. This is to be entered in the first Rate column, a similar entry made in the Amount, and this deducted from the previous current value shown, makes the result the present Current Value. The illustration is constructed for twenty-four years' entries, with eight entries extended. A close examination of the illustration will make clear all the procedures and the details of the form

can be altered to suit individual requirements. Time and labor saving short cuts are quite possible. The entries may be made for groups instead of individual machines. Looms or knitting machines may be entered in groups of four, eight, or any other convenient number.

No doubt the starting of a Plant Ledger requires a great deal of labor, but when once started its maintenance is simple and needs little additional work. It will be necessary that every new machine added during the year, every new improvement, attachment or new article made on the machine are entered at once, and at the end of each year the rates of depreciation and current values extended.

This is also an example of a perpetual system of control.

Let us now presume that we are at the end of the year. The extensions described above have been made. The ledger cards for all machines discarded or sold during the year are taken out of the files. The proceeds of such sales credited to the Depreciation Reserve Fund Account and the Plant Ledger contain again nothing but machines in actual use. The management will do well to inspect the cards at this time and make such corrections as are advisable. The last extensions of the Amounts and Current Values for each department are added, and from the totals two index sheets are prepared.

An Inventory Sheet is quite conventional, so there is no need to illustrate it.

The Depreciation Sheet will probably be similar to illustration: (Form 12)

Every month's production will now be responsible for its share of the depreciation, which will, with all other burden factors, vary in inverse proportion to the output. The product of the month will pay for it and the amount will, in turn, find its way as a charge to the Depreciation Reserve Fund Account.

The management is now in a position to gauge the purchases of new machinery by knowing exactly how far it can

go in each department without drawing on the surplus or profit. The task of keeping a plant to its highest pitch of efficiency will lose some of its tediousness if the manager has within his reach dependable and quick data relative to the machinery. The dreaded computation of the yearly depreciation and its proper distribution becomes now a mere matter of accounting.

Maintenance of Machinery

We now turn to the last item of the Departmental Burden—the cost of maintaining machinery and equipment.

TABLE OF DEPRECIATION DISTRIBUTION FOR THE YEAR 1919

Department	Year's Amount of Depreciation	Monthly Amount of Depreciation	Charge to the Monthly Burden of—
L	$1,451.50	$120.96	Department L
M	572.90	47.74	Department M
N	747.30	62.28	Department N
O	1,705.20	142.10	Department O
P	1,635.80	136.32	Department P
R	1,119.60	93.30	Department R
Office	139.00	11.59	Office
Shipping	97.10	8.09	Shipping
Stock Room	175.30	14.62	Stock Room
Store House	237.10	19.75	Store House
Engine Room	410.15	34.16	Engine Room
Welfare	117.00	9.75	General Burden
Totals	$8,407.95	$700.66	

Form 12

Every mill's stock room will disclose hundreds of items of machine parts to repair and replace the constant wear and tear of the equipment. There is also the mill's own machine shop, constantly employed in maintaining and repairing the equipment; a very important item of expense, which must be charged in proportion to its use by the various departments. Knitting needles, shuttles, picker sticks, spare machine parts, belting,

etc., are all items of maintenance. These items are charged to the departments only when in actual use, after which they must find their way into the cost. The labor and material used in mending a broken gear, and the thousand other small repair jobs, are all maintenance charges and will be charged to the departments.

The records of the control will have to show all these items arranged into departmental units ready for the monthly distribution, but not under a blanket charge which is bound to work injustice. Each department must bear its just share of the cost of maintenance. We must also bear in mind that, charging the actual monthly maintenance to the month's production cost will work another injustice and false cost. This will be best illustrated by an example. The usefulness of a set of card clothing may extend over many months or even years, this all depending on its handling and nature of material. It is clear that the cost of reclothing, if charged in rigid monthly maintenance cost, will result in false cost figures. The same holds true for repairing a gear or replacing a broken vibrator.

This brings in a new factor—the proper application of the various burden units—the discussion of which is the purpose of the next chapter.

The method of charging off depreciation, maintenance, and repair items, either on buildings, machinery or other equipment, is a subject of the regulations of the Federal Income Tax Law. The more important phases of these regulations should be known to every business man, therefore, an extract of these regulations is given in illustration (Form 13).

Form 13

"791.

(3) In any case in which the cost of capital assets is being recovered through deductions for wear and tear, depletion or obsolescence any expenditure (other than ordinary repairs) made to restore the property or prolong its useful life should be charged against the property account or the appropriate reserve and not against current expenses.

"941. COMPENSATION FOR LOSS:

"In the case of property which has been lost or destroyed in whole or in part through fire, storm, shipwreck or other casualty, or where the owner of property has lost or transferred title by reason of the exercise of the power of requisition or eminent domain, including cases where a voluntary transfer or conveyance is induced by reason of the fact that a technical requisition or condemnation proceeding is imminent, the amount received by the owner as compensation for the property may show an excess over the value of the property on March 1, 1913, or over its cost, if it was acquired after that date (after making proper provision in either case for depreciation to the date of the loss, damage or transfer). The transaction is not regarded as completed at this stage, however, if the taxpayer proceeds immediately in good faith to replace the property, or if he makes application to establish a replacement fund as provided in the following article. In such a case the gain, if any, is measured by the excess of the amount received over the amount actually and reasonably expended to replace or restore the property substantially in kind, exclusive of any expenditures for additions or betterments. The new or restored property effects a replacement in kind only to the extent that it serves the same purpose as the property which it replaces without added capacity or other element of additional value. Such new or restored property shall not be valued in the accounts of the taxpayer at an amount in excess of the cost or value at March 1, 1913, if acquired before that date (after making proper provision in either case for depreciation to the date of the loss, damage or transfer), of the original property, plus the cost of any actual additions and betterments. If the taxpayer does not elect to replace or restore the property, the transaction will then be deemed to be completed and the income shall be measured by the excess of the amount of the compensation received over the cost of the property or its actual value at March 1, 1913, if acquired before that date (after making proper provision in either case for depreciation to the date of the loss, damage or transfer)."

"1188. LAW II 153. AMOUNTS PAID OUT FOR NEW BUILDINGS OR FOR PERMANENT IMPROVEMENTS ARE NOT DEDUCTIBLE:

"(b) Any amounts paid out for new buildings or for permanent improvements or betterments made to increase the value of any property or estate;"

"1189. LAW II 154. EXPENDITURES COVERED BY DEPRECIATION ALLOWANCE ARE NOT DEDUCTIBLE:

"(c) Any amount expended in restoring property or in making good the exhaustion thereof for which an allowance is or has been made; or"

"1190.

"Amounts paid for increasing the capital value or for restoring the depreciated value of property are not deductible from gross income. Amounts expended for securing a copyright and plates, which remain the property of the person making the payments, are investments of capital. The cost of defending or perfecting title to property constitutes a part of the cost of property and is not a deductible expense. The amount expended for architect's services is part of the cost of the building. Commissions paid in purchasing securities are a part of the cost price of such securities. Commissions paid in selling securities are an offset against the selling price. Expenses of the administration of an estate, such as court costs, attorney's fees and executor's commissions, are chargeable against the corpus of the estate and are not allowable deductions. Amounts to be assessed and paid under an agreement between bondholders or stockholders of a corporation, to be used in a reorganization of the corporation, are investments of capital and not deductible for any purpose in returns of income. An assessment paid by a stockholder of a national bank on account of his statutory liability is similarly not deductible.

"1191.

No deduction from gross income may be made for any amounts paid out for new buildings or for permanent improvements or betterments made to increase the value of any property, or for any amounts expended in restoring property or in making good the exhaustion thereof for which an allowance for depreciation or depletion or other allowance is or has been made, or for any amounts paid for premiums on any life insurance policy covering the life of an officer or employee or of any person financially interested in the business of the corporation when the corporation is directly or indirectly a beneficiary under such policy.

"1200. REPAIRS.

"The cost of incidental repairs which neither materially add to the value of the property nor appreciably prolong its life, but keep it in an ordinarily efficient operating condition, may be deducted as expense, provided the plant or property account is not increased by the amount of such expenditures. Repairs in the nature of replacements, to the extent that they arrest deterioration and appreciably prolong the life of the property, should be charged against the depreciation reserve."

"1306. VOLUNTARY REMOVAL OF BUILDINGS.

"Loss due to the voluntary removal or demolition of old buildings,—the scrapping of old machinery, equipment, etc., incident to renewals and replacements will be deductible from

gross income in a sum representing the difference between the cost of such property demolished or scrapped and the amount of a reasonable allowance for the depreciation which the property had undergone prior to its demolition or scrapping; that is to say, the deductible loss is only so much of the original cost of the property, less salvage, as would have remained unextinguished had a reasonable allowance been charged off for depreciation during each year prior to its destruction. When a taxpayer buys real estate upon which is located a building which he proceeds to raze with a view to erecting thereon another building, it will be considered that the taxpayer has sustained no deductible loss by reason of the demolition of the old building, and no deductible expense on account of the cost of such removal, the value of the real estate, exclusive of old improvements, being presumably equal to the purchase price of the land and building plus the cost of removing the useless building."

"1328. LAW II 133. REASONABLE ALLOWANCE FOR DEPRECIATION OF BUSINESS PROPERTY IS DEDUCTIBLE.

"(8) A reasonable allowance for the exhaustion, wear and tear of property used in the trade or business, including a reasonable allowance for obsolescence."

"1329. LAW II 306. (CORPORATIONS.)

"(7) A reasonable allowance for the exhaustion, wear and tear of property used in the trade or business, including a reasonable allowance for obsolescence."

"1330. DEPRECIATION.

"A reasonable allowance for the exhaustion, wear and tear and obsolescence of property used in the trade or business may be deducted from gross income. For convenience such an allowance will usually be referred to as covering depreciation, excluding from the term any idea of a mere reduction in market value not resulting from exhaustion, wear and tear or obsolescence. The proper allowance for such depreciation of any property used in the trade or business is that amount which should be set aside for the taxable year in accordance with a consistent plan by which the aggregate of such amounts for the useful life of the property in the business will suffice, with the salvage value, at the end of such useful life to provide in place of the property its cost, or its value as of March 1, 1913, if acquired by the taxpayer before that date."

"1331. DEPRECIABLE PROPERTY.

"The necessity for a depreciation allowance arises from the fact that certain property used in the business gradually approaches a point where its usefulness is exhausted. The allowance should be confined to property of this nature. In the case of tangible property, it applies to that which is subject to wear

and tear, to decay or decline from natural causes, to exhaustion, and to obsolescence due to the normal progress of the art or to becoming inadequate to the growing needs of the business. It does not apply to inventories or to stock in trade; nor to land apart from the improvements or physical development added to it. It does not apply to bodies of minerals which through the process of removal suffer depletion, other provision for this being made in the statute. Property kept in repair may, nevertheless, be the subject of a depreciation allowance. The deduction of an allowance for depreciation is limited to property used in the taxpayer's trade or business. No such allowance may be made in respect of automobiles or other vehicles used chiefly for pleasure, a building used by the taxpayer solely as his residence, nor in respect of furniture or furnishings therein, personal effects, or clothing; but properties and costumes used exclusively in a business, such as a theatrical business, may be the subject of a depreciation allowance.

"1352. RATE FOR COMPUTING.

"No definite rate has been fixed by which an allowable deduction on account of depreciation in the value of any class of property subject to wear and tear is to be computed, but it is contemplated that this allowance shall be computed upon the basis of the cost of the property and the probable number of years constituting its life."

"1353. AT WHAT RATES MAY DEPRECIATION BE CLAIMED AND UNDER WHAT CONDITIONS?

"As the rate at which depreciation may be claimed is dependent, in a greater or less extent, upon local conditions, the use to which the property is put, and its probable lifetime under normal business conditions, no specific rates at which it may be claimed have ever been established. The Law states that a 'reasonable allowance' may be claimed and it is for the taxpayer to determine what constitutes a 'reasonable allowance.' To compute the amount which may be claimed, a taxpayer should determine the probable lifetime of the property, then divide its cost to him by the number of years it will be usable in a business in which employed, and the result thus obtained will represent the amount which may be claimed each year as a deduction, e.g., a frame building, the probable lifetime of which, without repair or replacement, is 25 years, cost $5,000. Divide $5,000 by 25, and claim $200 each year as depreciation."

"1354.

"While each taxpayer must determine the probable lifetime of his property without regard to the following figures, it has been estimated that the average usable lifetime of a frame building is 25 years, a brick building 35 years; a stone building or steel and concrete building, 50 to 100 years. The

estimated lifetime of ordinary machinery is ten years, that of automobiles used for business or farm purposes and farm tractors, four to five years.

"1363. CHARGING OFF DEPRECIATION.

"A depreciation allowance, in order to constitute an allowable deduction from gross income, must be charged off. The particular manner in which it shall be charged off is not material, except that the amount measuring a reasonable allowance for depreciation must be either deducted directly from the book value of the assets or preferably credited to a depreciation reserve account, which must be reflected in the annual balance sheet. The allowances should be computed and charged off with express reference to specific items, units or groups of property, each item or unit being considered separately or specifically included in a group with others to which the same factors apply. The taxpayer should keep such records as to each item or unit of depreciable property as will permit the ready verification of the factors used in computing the allowance for each year for each item, unit or group."

"1376. A REASONABLE AMOUNT FOR THE AMORTIZATION OF CERTAIN ASSETS (SPECIAL—DUE TO THE WAR) IS DEDUCTIBLE:

"(9) In the case of buildings, machinery, equipment, or other facilities, constructed, erected, installed, or acquired, on or after April 6, 1917, for the production of articles contributing to the prosecution of the present war, and in the case of vessels constructed or acquired on or after such date for the transportation of articles or men contributing to the prosecution of the present war, there shall be allowed a reasonable deduction for the amortization of such part of the cost of such facilities or vessels as has been borne by the taxpayer, but not again including any amount otherwise allowed under this title or previous Acts of Congress as a deduction in computing net income."

CHAPTER V

THE BURDEN AND ITS PROPER APPLICATION

All through this discussion of burden, monthly burden divisions are referred to;— an innovation for those who are accustomed to use the last year's or last season's burden results as a basis for their calculations. A cost system should serve a double purpose;—first, it should give a dependable foundation for cost estimates needed for future business; and secondly, serve as a means of control, so that the actual cost of manufacturing is within the limit of pre-production estimates. With all burden lumped together, and without a monthly pro-rata distribution, proper estimation and control is impossible. Very few textile manufacturers have but one article for a product, and that this should be the same year in and year out is even more rare, so what definite data can a lumped amount of last year's burden give? It may represent the charge on six articles, but each are of different cost, with the conditions of labor market and cost factors constantly changing. Only a staunch supporter of the "rule of thumb" method will defend this lump sum system, that tells only at the end of the year what the burden is for the previous twelve months on all articles manufactured, against the monthly distribution system that tells what it cost to manufacture each article for the last four weeks.

Now we will consider one of the fundamental principles of a proper cost control system. During the month all activities will be centered in following production and in registering

in the proper records the consumption of all materials and labor connected with manufacturing. Raw material and direct labor are registered *directly,* and at the end of the month, to complete the task of cost control registry, we need only the burden items, *based on the performance of that month and not the previous month or the previous year.* During the month all burden factors are arranged in the proper accounts, and at the close of the month charged in proportion of actual use to the various departments, their percentage relation to the direct labor of the departments computed, *and this percentage added in proportion to the direct labor charge of each article of each department, and the true cost of an article thus obtained.*

All burden charges can now be divided into two classes:

Constant Burden, the cost of which can be determined in advance for a year or a season and the amount evenly distributed for monthly charges. Such items are Rent, Insurance, Taxes, Depreciation of Machinery; also monthly charges that refer to the month alone, like Indirect Labor, Power, Light and Heat.

Variable Burden, the cost of which *cannot* be determined in advance. The use of the particular monthly items are not restricted to the production of the month. Such items are Supplies, Machinery and Equipment Maintenance. In such instances the monthly burden is the *average* cost for a suitable period. In a normal business, where production is not curtailed by seasons, this period is one year. For illustration, we will suppose that the Maintenance Burden for a Department for January of the current year is to be computed. The debit side of the Maintenance Account of the Department contains the following charges for the last twelve months, including the charge of the current month:

February	28, 1919.....	$115.10
March	31, 1919.....	61.37
April	30, 1919.....	73.50
May	31, 1919.....	33.19
June	30, 1919.....	165.40
July	31, 1919.....	81.10
August	31, 1919.....	37.45
September	30, 1919.....	72.10
October	31, 1919.....	43.40
November	30, 1919.....	55.63
December	31, 1919.....	47.30
January	31, 1920.....	59.43
Total.....		$844.97
This divided by the months (12) equals		70.42,

the Maintenance Burden of the Department for the month.

Now we can state the rule for the monthly distribution of Variable Burden. Add up the charges for the number of months (including the current month), used as a basis, and divide this total by the number of months; the result is the current burden charge of the Variable Burden.

There are certain branches of the industry where, by the nature of the product, the mill is forced to a period of idleness. This may be a month, or possibly longer, when, with the exception of sample making, the mill ceases its productive activity. In such instances, all charges referring to such periods are divided among the productive months as an addition to General Burden, which will also carry the cost of samples. *The Variable Burden will in this case be based on the number of active productive months of the business.*

Finally, there is another possibility which may require an adjustment of the Variable Burden distribution. This may happen in any organization. Let us presume that the conditions in a department are such that a great number of machines are changed, the cost of which cannot be charged as improve-

ments or new attachments to the machines but is plainly a maintenance charge. If such expenditure is called for on account of seasonable or special articles to be produced, the total charge must be carried by such special order, the total cost divided by the total order and the unit cost charged to unit production of the article. It is obvious that the responsible order has to pay for such expenditure.

If such charge is caused through general wear and tear, the years of usefulness of the improvement is estimated, the charge is carried in a separate account, and the monthly fraction of the cost is added to the monthly maintenance burden of the department until the charge is paid for.

This concludes the discussion of Departmental Burden, and we turn to the next cost factor.

CHAPTER VI

THE GENERAL BURDEN AND ITS FACTORS

In the previous chapters we fully discussed Departmental Burden and its factors. The departments designated by letters were regarded as productive departments, which for a spinning mill could be interpreted as opening, carding, combing roving, spinning, machine shop, etc.; or for a weaving plant as winding, warping, weaving, finishing, dyeing, machine shop, etc.; or for a knitting plant as winding, knitting, bleaching, cutting, assembling, finishing, boxing, etc. But in every branch of manufacturing there are a number of departments of a non-productive nature the expense of which have to be redistributed in the cost of production. These are in most instances the expenses of the office, shipping department, stock room, store house, welfare division and engine room. This last item is the only one which will be distributed *directly* among the productive departments according to the index number of consumption, while the others must be charged collectively after the departmental costs for the month have been computed. Such a charge is known as the *General Burden,* which represents a summary charge of the above factors. But this is not all that General Burden is responsible for; *it also must contain the monthly share of every other item of cost that cannot be classified under the remaining cost factors,* such as—

Selling Burden
Boxing and Packing

Outward Freight
Cash Discount
Selling Commission

These factors of General Burden, if closely examined, may be classified into sections, such as—

(a) *Constant Burden,* the charges for which are determined in advance, usually for a year, and distributed in even monthly units.

(b) *Constant Burden,* the charge for which are determined every month.

(c) *Variable Burden,* based on the last twelve months' average and charged monthly.

Under the (a) Constant Burden the following items are included:

Rental: Part of the rental that is not chargeable directly to departments.

Insurance: All insurance, with the exception of Fire and Workmen's compensation, these two being charged in departmental burden.

Taxes: All taxes *chargeable to cost,* excepting real estate which has been included in rental and so charged under departmental burden.

Administrative Salaries: All salaries of officers and directors.

Interest on Capital Investment: It should be borne in mind that this charge as a cost factor *is not recognized by the Federal Government as a legal cost charge,* the point of view being that this item is a part of the profit obtained in business. Therefore, this factor has no legal standing in tax computations. But from the point of sound business economics, interest on capital investment is a part of the cost. Capital invested in *any* business venture should insure to the investors a return at least at the rate of the lowest risk, as a compensation surety for the higher risk taken by the capital. For such

return, the enterprise is morally responsible, and so it should be included in the cost of the article. The profit on this low risk rate is then a bonus for the risk which such capital should surely enjoy, because such higher risk capital is extremely sensitive to economical depressions, when profits cease altogether. What business man would deny this right for capital to have a place among the cost factors and thus increase its security?

The question now is—what should this rate be and what is the best method of charging it? Federal, State and Municipal Bonds form a first class security of extremely low return. Mortgage on real estate with a proven title is the next on the list. A line of safety must, therefore, lie between these two securities. According to this, a return of 4% on the capital investment should be secured as far as possible through its incorporation into the cost of the article. Let us presume that the capital investment of a business is $120,000. The yearly interest on this amount at the above rate will amount to $4,800, or $400 per month. This monthly share should, therefore, be charged to cost every month as a factor in the General Burden of Cost. We can now turn to the next factor.

(b) *Constant Burden:* Including the items of Salaries of Employes, Indirect Labor and Interest on Loans.

Salaries of Employes and Indirect Labor: All expenditures for the month of this nature that cannot be distributed under departmental burden are charged to General Burden under this division. Such charges are the salaries of the superintendent, office salaries of those employed exclusively for mill administration, watchmen, elevator men and kindred labor.

A bonus, premium or reward is not always chargeable to cost. If it is definite and based on performance, efficiency or attendance, it belongs to cost under the same division as

the regular earnings, viz., direct labor, departmental indirect labor or general burden indirect labor. However, if such extra or conditional compensation is disbursed at the end of the year, depending on the surplus profit of the year, it must be classified as profit sharing and as such cannot be charged to cost but will constitute an item for reduction from the year's gross profit.

A frequent mistake of burden distribution is that of charging directly to general burden the salaries of purchasing agent, stock clerk and shipping clerk. This is wrong. They belong to departmental burden; the first two to stock room and the last to shipping room.

Interest on Loans: This item of cost must be included in the general burden, and the most convenient method is to charge each month's amount where any exists to this burden. But there is another point for consideration. Discount on cash payment of purchases is usually one advantage derived from such loans and, for this reason, the monthly total of such discounts should be deducted from the interest paid, so that only the excess will form a general burden charge. If discounts exceed the interest on loans, the difference should be deducted from the total of the general burden before distribution. The application of last year's loan charges to this year's business is not correct. Business may take a turn and this method will not reflect the true condition. So, if on account of the nature of the business such monthly distribution is difficult, it is better to deduct the interest on loans from the discounts on purchases and charge the difference to profit and loss.

(c) *Variable Burden,* based on the average for the last twelve months. The handling of such burden factors has been explained in the previous chapter, and the following cost factors of general burden belong to this classification.

Losses and Damages to Product. This includes "sec-

onds" or total damages to product not covered by insurance and likely to occur in any business. The original cost of all such product is charged to this account, to which also the proceeds from sales of such goods are credited. The monthly average of the difference is charged to cost under the General Burden.

Expenses not otherwise chargeable to Departments. Such items are pensions and other donations within the limit of business expense, constituting an *accepted responsibility,* and as such entitled to a place among the cost factors.

Supplies not otherwise chargeable to Cost. During the year's business there will be a number of items for which no department is responsible. In a well organized control system this account will be very small, but, nevertheless, it is an item of General Burden.

The Selling Burden and its Factors

We have now arrived at the final important burden factor of cost—the Selling Burden. The definition itself suggests that all costs pertaining to selling must be charged under this burden to the cost of the goods that have actually been sold. For the average mill, this burden might consist of:

Salaries of Salesmen forming a constant monthly or seasonable charge.

Traveling Expenses forming a constant monthly or seasonable charge.

Advertising Expenses forming a constant monthly or seasonable charge.

Entertaining Expenses forming a constant monthly or seasonable charge.

Rent and Maintenance of Sales Office forming a constant monthly or seasonable charge.

Cost of Samples. The *net cost* of samples after the proceeds from the sale of samples have been de-

ducted. This is figured on the seasonable cost and charged in proportion to monthly production.

Share of Office Burden pertaining to selling. In large organizations, it is worth while to keep two burden accounts for the office. One for manufacturing and another for selling. Otherwise the proportion of each must be determined by the management.

The remaining factors of cost to be charged direct are

Boxing and Packing
Outward Freight
Cash Discount
Selling Commission

While each of the above factors will have an account in the cost system, they are charged direct to the cost of selling in the cost calculations. The items themselves are self-explanatory and need no further discussion.

CHAPTER VII

DETERMINING THE BURDEN AT THE END OF THE MONTH

The previous chapters have dealt with the distribution of the burden and its factors. Let us now presume that we are at the end of the month, and to complete the circle of control and obtain the total cost of the production for *each aricle* during the month the accounts must be closed and the various burden factors entered into the cost accounts. We are already acquainted with the index factors for such cost, as rent, power, light, heat and depreciation, and until we can analyze the mechanics of the controlling accounts, we will accept the statement that all other burden factors have reached their right places on the records and are ready for distribution.

Departmental Burden of the productive departments will be the first to receive attention. In order to be able to do so we add the cost of power, light and heat and close the account of the Engine Room, which represents this total cost, the power items and distribute it according to the index percentages among the other departments.

This having been done, the burden accounts of the productive departments are closed, and the following table prepared:

Department	Direct Labor Cost for the Month	Burden Cost for the Month	Direct Labor and Burden Cost for the Month	% of Burden to Direct Labor
L	$355.60	$211.55	$567.15	60%
M	1,211.22	351.10	1,562.32	29%
N	768.98	115.90	884.88	15%
O	1,961.10	685.15	2,646.25	35%
P	3,105.13	2,137.45	5,242.58	69%
R	211.13	351.90	563.03	167%
Totals	$7,613.16	$3,853.05	$11,466.21	

Since the detailed records of production show the cost of material and direct labor for each article, entered at the time of production in convenient units, the total cost for each department is easily obtained by adding up the details of the month and *charging the departmental burden in one single operation in its percentage relation to the direct labor,* which has been obtained in the above table.

We will now list from the accounts the factors of the General Burden, and presume that the accounts for the month show the following balances:

Burden Factor	Month's Cost
Rental not otherwise chargeable	$17.55
Power, Light and Heat, not otherwise chargeable	31.10
Office, two-thirds of total	508.88
Store House	190.10
Stock Room	446.55
Shipping Room	216.14
Welfare	193.17
Insurances not otherwise chargeable	67.45
Taxes not otherwise chargeable	31.37
Administrative Salaries	1,050.00
Interest on Capital Investment	400.00
Salaries of Employees and Indirect Labor (not departmental)	915.10
Interest on Loans (cost over discounts)	97.55
Loss on Seconds and Damages	137.50
Expenses not otherwise chargeable	155.10
Supplies not otherwise chargeable	13.11
Total Month's Cost of General Burden	$4,470.67
Total Month's Cost of Direct Labor	$7,613.16
Percentage of General Burden for the Month	59½%

Now there will be no hesitation in our minds *how* to construct the cost control records. One month will be the cost period, and we will have a record for each article. It will show the cost of raw materials, the direct labor cost for each

department, the burden cost for each department, the total burden cost for all departments, *the total direct labor cost for all departments; and based on this last information we will arrive directly at the General Burden each article has to carry in its percentage relation to the total direct labor.*

It is now easy to understand the meaning of direct labor's relation to burden. A bale of cotton may be spun and made into coarse yarn and then into coarse gauge fleeced underwear and sold for twelve dollars a dozen. The same bale may be spun four times as fine, then mercerized and turned into a soft silky garment to satisfy the demands of Milady, selling for fifty dollars a dozen.

The cost of producing an article is in direct ratio to the productive labor put into it; therefore, the departmental burden on any article made at the same time but of varying direct labor costs is as the departmental direct labor cost is to the total departmental burden, and the general burden on any article made at the same time, but of varying direct labor cost is as the total direct labor cost is to the total general burden. From this it is evident that if the total productive labor cost of a department for a period and the total departmental burden cost are known, the percentage relation of these two totals will hold good for any article manufactured during this period. The same is true for general burden and its relation to the sum of all productive labor cost.

The Distribution of Selling Burden

If the above holds good for departmental and general burden, it should hold good for selling burden as well. No matter what industry or branch of industry is taken, an analysis of the articles manufactured by one organization will follow the above rule. Even if one organization manufactures the highest grade and the cheapest grade of an article (which is rather an exception than the rule) the result will be the same.

High grade articles carry most productive labor; cheap articles least productive labor. So selling burden will also be based on productive labor as given below:

Selling Burden Factor	Month's Cost
Salaries of Salesmen	$255.00
Traveling Expense	177.50
Advertising Expense	55.45
Entertaining Expense	17.13
Rent and Maintenance of Sales Office	62.37
Cost of Samples	23.20
Share of Office Burden	254.44
Total Month's Cost of Selling Burden	$845.09
Total Month's Cost of Direct Labor	$7,613.16
Percentage of Selling Burden for the Month	11%

As mentioned previously this selling burden does not include boxing and packing, outward freight, cash discount and commission, which items must be added directly.

This concludes the discussion of Burden and its Relation to Cost. We have learned that a cost control system is not a case of individual opinion, but must be built on definite lines. The records will be constructed to serve the ultimate purpose and not for incoherent temporary information. We have established standards by which to measure the various cost factors. In regard to time, a month will be the unit for departmental, general and selling burden.

The character of business will vary with each individual mill and the cost control system must be molded to fit such individuality, otherwise it will be either insufficient or clogged with red tape.

For the various branches of the textile industry, the following list represents the possibilities of business divisions:

Yarn and Cloth Industry

COTTON BRANCH

a Spinning
b Spinning, Dyeing and Finishing
c Weaving
d Spinning and Weaving (either all yarn for mill consumption or portion for sale)
e Spinning, Weaving, Dyeing and Finishing
f Spinning, Weaving, Dyeing, Printing and Finishing
g Weaving, Dyeing and Finishing
h Weaving, Dyeing, Printing and Finishing
i Dyeing and Finishing
j Dyeing, Printing and Finishing

WOOLEN AND WORSTED BRANCH

k Sorting and Scouring
l Sorting, Scouring and Top Making
m Top Making
n Shoddy Manufacturing
o Spinning (all operations, from sorting on, or from picking on)
p Spinning and Dyeing
r Spinning and Weaving (either all yarn for home consumption or portion for sale)
s Spinning, Weaving, Dyeing and Finishing
t Weaving
u Weaving, Dyeing and Finishing
v Dyeing and Finishing

SILK BRANCH

aa Throwing
bb Throwing and Weaving
cc Throwing, Thread-making
dd Throwing, Thread-making and Weaving
ee Weaving
ff Throwing, Weaving, Dyeing and Finishing
gg Throwing, Thread-making, Weaving, Dyeing and Finishing
hh Weaving, Dyeing and Finishing
ii Dyeing
jj Dyeing and Finishing

Knitting Industry

HOSIERY BRANCH

kk Spinning and Knitting
ll Throwing and Knitting
mm Spinning, Knitting, Dyeing and Finishing
nn Throwing, Knitting, Dyeing and Finishing
oo Knitting
pp Knitting, Dyeing and Finishing

SWEATER BRANCH

rr Spinning and Knitting
ss Spinning, Knitting, Dyeing
tt Knitting
uu Knitting and Dyeing

UNDERWEAR AND GLOVE BRANCH

vv Spinning and Knitting
ww Spinning, Knitting, Garment Making
zz Knitting and Garment Making

BRAID BRANCH

ad Spinning and Braiding
af Spinning, Braiding, Dyeing
ag Braiding
ah Braiding, Dyeing
(NOTE.—The process of bleaching is always included in dyeing.)

From the above list, look up the key letter of your particular business division, and under the same key letter in the following index may be found the most probable departmental divisions.

It should be borne in mind that if any of the operations are done by an outsider, the cost of such work is added to the material cost and so cannot carry burden. For instance, the plant weaving exclusively has its product dyed and finished outside at an agreed amount. This plant *purchases* this improvement to its product and cannot base the burden on such

expenditure. The productive labor of the weaving operations will remain the index for burden distribution.

Yarn and Cloth Industry

COTTON BRANCH

a Spinning:
General Burden and Selling Burden to be based on the total of the productive labor of all departments.

b Spinning, Dyeing and Finishing:
General Burden and Selling Burden to be based on the total of all productive labor of all departments. It is self-evident that yarn sold "in the grey" will have less productive labor and will carry proportionately less burden.

c Weaving:
General Burden and Selling Burden to be based on the total of the productive labor of all departments.

d Spinning and Weaving:
If some of the product is sold as yarn and the balance as fabric, the rule "burden on productive labor" holds good for both products. So the burden percentages will be computed on the total productive labor of the month, disregarding what has been sold as yarn or as fabric. When the burden is applied in the cost accounts, the yarns will carry the just share of these burdens. Control records will be in two sections, "Spinning" and "Weaving." This involves a change of units from pounds to yards.

e Spinning, Weaving, Dyeing and Finishing:
General Burden and Selling Burden to be based on the total productive labor of all departments. No mill having such extensive production field would find practical the construction of one record for the cost control of the mill. It would be impractical in the extreme. The product itself suggests a four-fold natural division; viz.:
from opening to spinning (twisting)
from spooling to dressing (warp), quilling (filling)
from drawing-in to weaving
and the finishing operations.

Each division will have its cost control records, and from the previous sections two balances will be forwarded as the basic information. "Total Departmental Cost," including material, waste and departmental burden, and "Total Productive Labor." This latter is carried forward to the final operations, where it forms the basis of the General Burden and Selling Burden cost for the month. The construction and the details of these records will be fully explained later.

f Spinning, Weaving, Printing, Dyeing and Finishing:
The same as above, but with a more extensive departmental division.

g Weaving, Dyeing and Finishing:
Similar to section "e," from which the first division from opening to spinning is eliminated.

h Weaving, Dyeing, Printing and Finishing:
The same as above, but with a more extensive departmental division.

i Dyeing and Finishing:
General Burden and Selling Burden to be based on the total of productive labor of all departments. Such a mill may be the most conveniently divided into the following departments:
Bleaching (this includes all preliminary operations).
Mercerizing.
Dyeing
Calendering
Folding (this includes all final operations).
Sewing and singeing operations are preliminaries that are included in bleaching. If product is yarns, the calendering is of course eliminated and instead of Folding, "Packing" will be the last item, this including quilling or other similar operations.

j Dyeing, Printing and Finishing:
The same as above, but with a more extensive departmental division.

WOOLEN AND WORSTED BRANCH

k Sorting and Scouring:
General Burden and Selling Burden to be based on the total of productive labor of all departments.

This branch is usually carried on in connection with dealing in wool and its control is simple, having but two departmental divisions, sorting and scouring, combined into one record.

l Sorting, Scouring and Top Making:
General Burden and Selling Burden to be based on the total productive labor of all departments. One cost control division will be sufficient, divided into the operations.

m Top Making (Combing):
The same as above.

n Shoddy Manufacturing:
General Burden and Selling Burden to be based on the total productive labor of all departments. One cost control division will be sufficient, divided into operations, of which sorting and carbonizing should be one.

o Spinning:
General Burden and Selling Burden to be based on the total productive labor of all departments. The nature of the woolen industry requires a different division than that of worsted. It is advisable to divide the cost control record of the former into

Sorting and Scouring
Picking and Carding
Spinning
Packing

while for worsted the divisions will be

Sorting and Scouring
Carding
Combing
Spinning
Packing

p Spinning and Dyeing:
The same as above, to which the division "Dyeing" (eventually "Singeing") has been added. See also note at section "b."

r Spinning and Weaving:
General Burden and Selling Burden to be based on the total cost of productive labor of departments. The cost control records will be divided into two

sections, one covering all spinning and the other all weaving operations. In reference to the possibility of selling some of the yarn product itself and its relation to burden, see note for section "d." In reference to handling the "Totals of Departmental Cost" and "Total Productive Labor" for all operations see note for section "e."

s Spinning, Weaving, Dyeing and Finishing:

The same as above, but the records will have four divisions, viz.:

Spinning (all operations)
Weaving (from spooling to weaving)
Dyeing (from washing to dyeing)
Finishing

t Weaving:

General Burden and Selling Burden to be based on the total cost of productive labor of all departments.

u Weaving, Dyeing and Finishing:

Same as section "s" without the spinning.

v Dyeing and Finishing:

General Burden and Selling Burden to be based on the total cost of productive labor of all departments. The cost control records must be divided into sections, the number of which will vary with the individual requirements of the mill. In reference to handling the "Totals of Departmental Cost" and "Total Productive Labor" for all operations, see note for section "e."

Silk Branch

aa Throwing:

General Burden and Selling Burden to be based on the total cost of productive labor of all departments. The cost control records should be divided into as many sections as there are main divisions of the product. Tram, Organzine and Crepe are the usual divisions.

bb Throwing and Weaving:

The absolute separation of these two divisions is the best plan. Silk by its high unit value, as

well as on account of its high hygroscopic nature, requires more stringent control than any other branch of the textile industry. Throwing is best controlled if organized on the lines suggested in section "aa." While weaving may be divided into two sections, "Preparatory," including warping, quilling, drawing-in and twisting-in, and "Weaving" for the other operations. General Burden and Selling Burden to be based on the total productive labor cost on Throwing and Weaving.

cc Throwing and Thread-making:

General Burden and Selling Burden to be based on the total cost of all productive labor of all departments. If the product is both thrown stock and thread, for throwing the divisions of "aa" should be used, while the thread operations should be divided into "Winding," "Doubling," "Twisting," "Finishing" (stretching) and "Packing."

dd Throwing, Thread-making and Weaving:

In the details of construction a distinct separation must be made for the fabric and the thread part of the business. This is one of the few instances where a triple control is absolutely essential. Each branch must yield a definite return, and consequently each branch requires an independent control. The factors of departmental burden, wherever possible, are computed and charged directly to the respective branch, and a separate control will be necessary for sections used by both branches. As an instance, we cite the winding department, or twisting department. They may be used for throwing and thread making as well. To allot for each branch so many machines in winding or twisting would be a very inefficient arrangement. At the end of the month, the departmental burden of such "common" departments is divided in proportion to the productive labor of the month. This item is charged during the month separately for each branch. General Burden and Selling Burden will also be divided in proportion to the productive labor of the two branches. Presume that for the month the final figures are as follows:

Total Productive Labor of Throwing and Weaving Branch.....	$15,000.00
Total Productive Labor of Thread Making Branch	3,000.00
Total General Burden	6,500.00
Total Selling Burden	1,500.00

The General Burden for throwing and weaving will be, therefore,

$$\frac{\$15{,}000 \times \$6{,}500}{\$15{,}000 + \$3{,}000} = 5{,}416.67$$

The General Burden for the thread making will be, therefore,

$$\frac{\$3{,}000 \times \$6{,}500}{\$15{,}000 + \$3{,}000} = 1{,}083.33$$

The Selling Burden for throwing and weaving will be, therefore,

$$\frac{\$15{,}000 \times \$1{,}500}{\$15{,}000 + \$3{,}000} = 1{,}250.00$$

The Selling Burden for the thread making will be, therefore,

$$\frac{\$3{,}000 \times \$1{,}500}{\$15{,}000 + \$3{,}000} = 250.00$$

However, it is possible that there are certain General Burden and Selling Burden expenditures referring distinctly to the thread branch, and it is presumed that such items are charged directly to the General Burden and Selling Burden accounts of the thread division. It is presumed that such general burden referring to "threads" amounted only to $332.89 and Selling Burden to $367.50. The final figures will be, therefore:

Throwing and Weaving Branch,

General Burden	$5,416.66
Productive Labor	15,000.00
Percentage share of General Burden on Productive Labor.....	36%
Selling Burden	1,250.00
Percentage share of Selling Burden on Productive Labor.....	8½%

Thread Making Branch,

General Burden	
Share of Common Account...	$1,083.34
Special Account	332.89
Total General Burden....	$1,416.23
Productive Labor	3,000.00
Percentage share of General Burden on Productive Labor.....	42½%
Selling Burden	
Share of Common Account...	$250.00
Special Account	367.50
Total Selling Burden....	$617.50
Percentage share of Selling Burden on Productive Labor.....	18½%

This is a concrete example of the fact that "burden on productive labor" needs no alteration, even in the most extreme instances. To obtain the right proportion for each branch and assure a just distribution would not be possible by any other method. Such "branch combination" is not restricted to the silk industry only, but it may occur in any branch.

ee Weaving:
The same as section "bb," without throwing.

ff Throwing, Weaving, Dyeing and Finishing:
The same as section "bb," but with the addition of two more divisions; "Dyeing," which, in case of skein or piece dye, subdivided into sections for each and further into "Black" and "Color" sections, if such step for control has an advantage. Silk dyeing with its loading operations forms a complicated management problem, and it will depend entirely upon the actual conditions how finely such subdivisions should be made.

gg Throwing, Thread-making, Weaving, Dyeing and Finishing:
The same as section "dd," but with the addition of section "ff."

hh Weaving, Dyeing and Finishing:
The combination of sections "bb" and "ff" without the throwing department.

ii Dyeing:
Considered exclusively only in the case of skein dye. The remarks referring to dyeing in section "ff" apply here also.

gg Dyeing and Finishing:
Same as section "ff," without throwing and weaving.

*** Knitting Industry**

HOSIERY BRANCH

kk Spinning and Knitting:
General Burden and Selling Burden to be based on the total of the productive labor of all departments. Control records divided into two sections, "spinning" and "knitting." The knitting section will have subdivisions according to the main operations, but in most cases three subdivisions, "winding," "knitting" and "boxing" are sufficient. At the start of the "knitting" section a change of units from pounds to dozens will be necessary. In this instance it is presumed that the mill has its product dyed and finished by an outside concern. If product is wool see section "o."

ll Throwing and Knitting:
For throwing in this case, on account of the similarity of products, the control must not be divided as in section "aa," and as subdivisions, "Winding," "Doubling," "Twisting" and "Finish Winding" are sufficient. Otherwise the same as section "kk."

mm Spinning, Knitting, Dyeing and Finishing:
The same as section "kk" to which "Dyeing" and "Finishing" control records must be added. The division "Boxing" in this case, however, will form a part of the Finishing division.

* During the run of articles in the Textile World Journal on the subject of Cost Control one hosiery manufacturer sent in a very interesting question on the subject of burden distribution. The problem discussed and the answer to it are worth repeating, as it will interest every hosiery manufacturer, therefore it is reprinted in this book as illustration 14.

Distributing the Burden

"Since the initial article on textile mill organization and costs appeared in your issue of February 17, we have been reading these items with a great deal of interest, and wish to propound a few questions to you, either for discussion or direct reply.

"In your third article, contained in issue of March 10, the matter of distribution of burden brought out a discussion among ourselves as to whether in our line of business (making of seamless hosiery) distribution of burden should be based on raw material and direct labor, or on direct labor only.

"We make a variety of styles, selling anywhere from two to twelve dollars, and if we figure our distribution of burden on a raw material and direct labor base, on the higher priced numbers, it brings our cost prices up to a figure where we could not compete with the mills who were figuring their distribution of burden and costs on a labor base. We understand this latter method is quite prevalent among hosiery mills, with the attendant contention that this is the true and correct method of figuring costs in hosiery mills.

"We wish to qualify this last statement by saying that we mean mills that buy their yarn and do nothing more than knit, dye and finish the stockings exclusively. While we will admit that there are redeeming features in figuring cost by distributing the burden on a direct labor base, yet the writer does not believe this to be the correct method of figuring costs in our line of business for the following reasons:

"(We will quote excerpts from your article of March 10, to be brief):

"'1. A higher priced article should carry a greater share of burden and a lower priced article a smaller share. This would not hold good if we were to figure our costs on a labor base.

"'2. Our direct labor on a stocking that sells for two dollars, as against one that sells for twelve dollars, involves a difference of only 3½c.

"'3. If we were to figure our costs on a direct labor base, taking the foregoing facts into consideration, it would mean nothing more or less than reverting back to the methods of figuring distribution by unit product, which is admittedly wrong in principle.

"'4. From our own standpoint the direct labor has little or no relation to the selling price, as it costs us (the direct labor) only

3½c more to make a twelve dollar style as against the two dollar style where the difference in raw material varies over 3½ dollars.

"'5. If we were to figure our costs on a direct labor base, we have every occasion to believe that the attractive costs obtained by this method of figuring, as against a raw material and direct labor base, would be an incentive to push the higher priced products to the detriment of the lesser, resulting in a decrease of the profits for the year, providing our sales did not so far exceed previous performances in volume as to overcome the difference in figuring costs on this basis, and possibly cover up the defects of the system.'

"Another point we wish to bring out is the fact that, althuogh there is little or no fluctuation whatever in our labor costs (a point in favor of figuring costs on a direct labor base), yet the fact remains that the variation of direct labor between the cheaper and the higher priced products is so small that it is practically negligible, and for this reason we are of the opinion that if we figure our costs on a direct labor base, we are virtually doing so on a unit base, and defeating the purpose of finding as near to an absolute cost on our products as is possible under this simple system of cost finding.

"In conclusion we wish to say that we are open to conviction. However, we would like to have some discussion on the problem, and bring out all the points, as we believe this matter is of vital interest to every manufacturer of seamless hosiery."

The Reply

In the first place the inquirer should have remembered that the statement, "A higher priced article should carry a greater share of burden, and the lower priced article a smaller share," referred to the illustrated case only where the difference of cost was as much due to the increased labor cost as it was to raw material. Taking up the questions in order:

1. Lack of space forbids the illustration of all possible instances in the textile industry, but the chart and table of comparative burdens was constructed in order that each manufacturer might substitute his actual cost factors and prove for himself the truth that burdens should be based on the direct labor only.

2. The fact that in this instance the difference of the direct labor costs varies only 3½c between articles selling at two dollars and twelve dollars, respectively, registers only the fact that the variation of the total cost is caused through the great difference between the values of raw materials and not through the increased production cost.

One hundred pounds of silk may be worth five hundred dollars, and one hundred pounds of cotton yarn may be worth fifty dollars; yet I am sure that nobody would think of charging his purchasing, storing and other expenses incidental to handling his raw material in proportion of 10 to 1. The space occupied by both is approximately the same and the same amount of labor is required to handle it. So even the distribution of storage expenses will be in proportion to weight and not to value.

After the monthly expense connected with handling the raw material has been charged to the cost of raw material (which in all cases is but a small fraction of the total burden), the remaining burden must be charged to production. To bring about the change indicated by the word "production," the manufacturer has to employ labor, known as direct labor. He also has to provide means to carry on this change, such as space, buildings, machines, power, light, heat; hire brains for direction and control; and all this is known as burden.

It is direct labor that causes the change in materials to a commodity of higher value. It is also direct labor that causes the burden. Therefore, direct labor must carry the burden. Whether it is figured on the amount paid or on man hours consumed, it makes no difference. That in this instance the difference of direct labor cost is very small between the various grades is a very happy coincidence, and this manufacturer should feel grateful that his cost system involves no extensive computations.

3. Of course, the burden will be uniform for all grades if the direct labor is uniform. This is decidedly not the "unit method" of burden distribution, which is wrong, and bases the units on total cost, or even on direct labor, but per unit production, disregarding the variations of costs.

4 and 5. Direct labor and burden have no relation to selling price. The selling price is usually the highest price a buyer is willing to pay for an article, disregarding what the cost of manufacture is. Every manufacturer must make profit and, therefore, will not produce an article on which this end cannot be realized. Your raw material is itself an investment upon which you must make a profit, disregarding the increased value through the manufacturing process. It is the law of economics that the profit on commodities must be in direct ratio to the unit investment.

The field for the sale of your two dollar article is one hundred times greater than for your twelve dollar article. The cheapest is a necessity, the more expensive a luxury. The cheapest will be the least affected by economic changes and it is, therefore, a safer investment, and you are satisfied with a moderate profit. The

first breeze of an economic stress might curtail or even entirely stop the sale of your twelve dollar article and you might be obliged to sell your stock at great sacrifice at a price regulated by the demand, which cares nothing whatever for the cost. In this case you take the bigger risk on your investment, hence you must realize a larger profit and usually do when conditions are normal.

I fail to see how the incentive to push the higher priced goods, which will bring a greater profit on capital invested, could decrease the yearly profits. It is the sales management's duty to co-operate with the manufacturing department and prevent excesses that would disturb the most advantageous balance of production.

If burden is based on direct labor, no matter which way the sales turn you will distribute in the right proportion all burden over all articles, regardless of how much or how little you manufacture of each grade. All other methods are but a gamble, and it is only an accident whether your yearly sheet of profit and loss will show profit or loss.

The chart referred to in the discussion is identical to the one reproduced at the beginning of the chapter on "Burden and its Distribution." This is an instance where one organization produced a high grade and a low grade article. This might occur in any branch, but the thing of special interest is the slight difference in labor cost between the cheapest and the most expensive product. In branches other than knitting, such a case is hardly probable. Even this extreme difference cannot alter burden distribution based on productive labor. If there is such a slight difference in the labor cost of the lowest and highest priced articles, then the difference in handling and supervision must be small also. To charge a higher burden than its just share based on productive labor would be very dangerous, because if the mill sells more of the low grade article, in fact if there is any change in the proportion of sales, it might result in some of the burden remaining undistributed, and such a difference would have to come from the profits (if there are any) on the low grade article.

nn Throwing, Knitting, Dyeing and Finishing:
The same as above, but instead of "spinning," the "throwing" section "ll" to be considered.

oo Knitting:
The same as section "kk," but disregard "spinning."

pp Knitting, Dyeing and Finishing:
The same as section "mm," but disregard "spinning."

SWEATER BRANCH

rr Spinning and Knitting:
Similar to section "kk," but the departmental divisions should be made with consideration to the requirements of this branch. Change units from pounds to dozens after winding.

ss Spinning, Knitting and Dyeing:
Dyeing in this branch is usually yarn dye. For "spinning" and "dyeing" the same as sections "o" and "p." For "knitting" same as above section.

tt Knitting:
Similar to section "rr" without "spinning."
Note—For full fashioned sweaters see section "zz."

uu Knitting and Dyeing:
Same as section "ss" without the "spinning."

UNDERWEAR AND GLOVE BRANCH

vv Spinning and Knitting:
General Burden and Selling Burden to be based on the total of the productive labor of all departments. Control records to be divided into two sections, "spinning" and "knitting." The knitting section to commence with knitting operation, winding considered as a spinning operation.

ww Spinning, Knitting and Garment-making:
The same as above, but with the addition of records for garment manufacturing control. It is important that the "total productive labor index" does not lose its identity until the garment is finished. Here a change of units will be essential at the commencement of garment manufacturing, from pounds to dozens. The control records of this mill will be divided, therefore, into four sections:
Spinning
Knitting
Bleaching, including washing, dyeing, etc.
Garment Making
Each section will have subdivisions for detail control of the departments. The total of productive labor per unit is forwarded until all operations are completed.

There is a tendency in this industry today to distribute burden on unit production. Nothing could be more dangerous to profit than this. This method throws an equal burden on all the products, the cheapest and the most expensive; such practice will ultimately mean that the cost of the cheapest article will be too high and that of the high grade article too low. The chart and table at the beginning of the "Burden Chapter" shows clearly the danger of such practice.

zz Knitting and Garment Making:

Same as above without the spinning operations, keeping the four sectional divisions, substituting "winding" instead of "spinning." The full fashioned sweater industry is classed with this branch.

Braid Branch

ad Spinning and Braiding:

General Burden and Selling Burden to be based on the total of the productive labor of all departments. For details on spinning; if cotton, see section "a," if worsted, see section "o." Ratchet winding and doubling is included in the spinning section. A change of units will be necessary at the beginning of the braiding operations from pounds to gross yards. The finishing operations form another section of control. This includes all operations after the product leaves the braiding machines. For certain articles, like shoe laces or ornaments, which are sold on a price per gross basis, another change of units will be necessary.

af Spinning, Braiding and Dyeing:

The same as above in general divisions. If product is dyed in the yarn or stock, for spinning cotton substitute section "b" for section "a;" for worsted, section "p" for section "o." If product dyed in braid form, this operation is added to the "finishing" control section.

ag Braiding:

Same as section "ad," without spinning operations. In this case the doubling and winding operations

form a section control by themselves and there will be three departmental divisions, such as
Winding
Braiding
Finishing

ah Braiding and Dyeing:
Same as above, but the control of dyeing operations is included in finishing.

Before turning to another cost factor, a few words may be said about the problem of the "goods in process" and its effect upon the correct distribution of burden. Departmental cost factors are registered only after an operation has been completed, so all departmental burden for the month is charged. Goods on the machines or uncompleted lots are carried forward for the production of the coming month.

For General Burden and Selling Burden the same rule holds good. Let us presume that the spinning department is accumulating yarn ahead of the weaving department. All cost, as far as the yarn production and its departmental burden goes, is included in the yarn cost. If the weaving department produced for the month its full capacity, the general burden and selling burden for the month will be lower in proportion to the accumulated reserve stock of yarn. If, again, the reserve stock is used up and production of spinning curtailed, the general burden and selling burden will be higher in proportion to the curtailed production of the spinning department. The difference balances itself, since the quantity of final product remains the same.

Now let us take an opposite case. Suppose an underwear factory produced a great quantity of knitted fabric this month as a reserve stock for the coming busy month and finished only a small portion of it as garments to which the general burden and selling burden can be applied. These two burdens will now be high and consequently the final cost of the garments produced during the month will carry the high burden rate. The

following month this accumulated stock is finished into garments, but the production of the knitting department is as high as in the previous month. Now the production of the finishing department reaches its normal state, which is a trifle over the knitting capacity, so knitted stock, accumulated the previous month, is gradually used up.

Let us presume that the month when this knitted stock was accumulated the finishing department worked only to one-third its capacity and the total productive labor for the mill amounted to $5,000.00 The amount of general burden was $1,250.00 or 25% on productive labor. Of this amount only $415 was distributed in the finished product because of the curtailment of garment making. The following month both departments worked to their full capacity with cost of productive labor in the amount of $9,000.00. The general burden was $1,350.00 or 15%. Now all this burden and as much of the undistributed general burden of last month as there has been accumulated stock worked up, is divided among the finished product for the second month.

No matter how long an unfinished product is kept in stock, if it received its departmental burden at the time of production it cannot escape its general burden and selling burden share. This covers the extreme theory of burden and its distribution.

At the end of the season or the year, from these monthly burdens, the average burden is easily computed and these averages form the basis for future cost calculations.

CHAPTER VIII

MANUFACTURING WASTE, ITS CONTROL AND RELATION TO COST

Some slight reference has already been made to manufacturing waste as a factor of cost. In the mixing room the worker opens a bale of cotton; the steel bands and burlap are thrown into a corner, and this act has already increased the cost or the purchase price by the difference between the value of cotton and the bagging of the same weight. Passing further, to the opening room, the bottom of the lapper is filled with the rejects of the machine in form of dust, dried leaves, etc. If we follow a bale all the way through the operations, the rejects increase; under the cards, in the strippings, under the broom of the sweeping boy, on the rolls of the spinning frame, in the apron pockets of the spinners. Some part of these rejects are carried back to the previous operation to be reworked, but the greater part, being unsuitable for production purposes, is sold at a certain market value, the proceeds of which must be deducted from the cost of materials. After all, the word "waste" in this sense is a misnomer, what we have is a "by-product."

We have before us a double task: First, to supply records for the management to control the quality of raw material and the care exercised in manufacturing. The same records must be the source of the cost control records for the individual lots. Second, for the establishment of control accounts which must tell at the end of the month what credits should be given for the value of the wastes.

In a cotton mill running on one grade of raw material,

the control is comparatively easy. Individual lots of the same grade of raw material begin to form mostly after the carding process, and the waste of the departments is easily computed on a percentage basis, but when using two or more grades of raw materials the control will be more complicated. In this case the waste records for each grade must be kept separately. The departmental records will now be in the form of daily reports added to an accumulative record in the office, which is closed weekly and then entered into the waste control account according to the grade of waste. This latter account is closed monthly and the values of the wastes made during the month computed.

All this is but an organization detail which will be taken care of with the other similar problems. Of special interest now is the method of distribution.

In theory, if the weight of the raw material is known before manufacturing and after manufacturing, the difference represents the waste. In practice, in any branch of the textile industry, this is but half the truth. There is an invisible loss due partially to the hygroscopic nature of all textile fibres and partially to the incorrect method of measuring the wastes. So in all cost and control records the quantity of waste made will be the difference between the starting and finishing weight of the material, while the credits due for the sales of the by-products will be calculated on the actual weight of waste.

The dividing lines should be not only departmental but for grade and lot units as well. A lump sum of waste made in the operations is useless for cost and control purposes. The information required is the waste for each grade of raw material or lots of the same grade. This refers to all divisions. The record will thus show the relation of actual waste to invisible loss for the various grades of the product and the cost of waste will be calculated, not on a departmental run as an average, but on the waste made on each article.

No matter what the product be, this procedure is the same; only the intensity of the control will vary with the value of the raw product.

A cotton spinning mill using but one grade of material can safely use ten thousand pounds as a unit. A silk throwing plant will not go higher than a few hundred pounds. In each case the weight of the raw material before and after processing would form but half the information; the weight of the actual waste made will be necessary to complete the material cost.

Incomplete or careless waste control methods are the source of many losses of profit or unexplained shrinkages of profit. Individual judgment or the result of one or two casual tests is unacceptable to modern cost control practice, which can recognize but one basis, the actual conditions. How this may be accomplished without excessive labor will form a part of the following chapters, while for the present the discussion taken from the pages of the *Textile World* will be interesting. In this case the mill's records show a very uncomfortable invisible loss caused through deficient control methods. The case does not necessarily refer to a spinning mill. A weave shed or a knitting mill might easily have a similar experience, and for the prevention of such conditions, modern management has accepted for cost control organization the slogan of "safety first."

The Question

We have recently started up a new mill, running on Sea Island cotton, for the manufacture of tire fabric. With the other mills which we operate the waste question has not been a very large one, both on account of the comparatively cheap price of the cotton used, and the fact that only a small percentage of waste is made. On Sea Island cotton, however, it is much different, and we are desirous of getting some information as to how we should handle the waste at this mill.

I am giving you herewith a memorandum of the production both of tire fabric and yarn, for we also make sale yarns at this

mill. These figures are for the first quarter in which it was run. In other words, the mill is a new one, and the machinery had to be stocked up.

Please outline for us, or better still, adopt arbitrary prices and work out a system for handling this. The cost of the yarn, in both the finished yarn sold and in the fabric, should be the cost after the spinning process, after which, in the case of the fabric, it is wound, twisted, beamed, woven and inspected.

We will shortly be confronted with another problem at this mill, in that we expect to use some Arizona cotton, which will not be run through the combers.

MEMORANDUM SUBMITTED BY INQUIRER

	Pounds
Production:	
Fabric (sales)	48,554
Finished Yarn (sales)	133,120
	181,674
Cotton used, 1,055 B/C	*409,779
Inventory at end of period:	
Cotton and Laps	8,541
Silver and Roving	43,171
Yarn	27,116
Yarn Ply	14,926
Fabric	222
	93,976
Card Room	40,048
Spinning Room	49,164
Weave Room	4,764
	93,976
Total waste sold, 93,963 lbs. as below:	
Combers	57,615
Card Strips	15,085
Card Sweeps	2,855
Motes	4,370
Card Flyings	3,344
Spinning Sweeps	1,495
Single Thread	1,404
Twister Thread	2,402
Twisting and Winding Sweeps	300
Bagging and Ties	5,093

*There is a discrepancy of 40,166 lbs. between the cotton used and the sum of the sales, waste and inventory as given by the inquirer. For this reason the total of the latter items, 369,613 lbs., is used as a basis in the reply. In other words, this cotton will lose about 10 per cent in waste rather than 30 to 35 per cent as in the case of the Sea Island.

Total labor, $25,684.70 as below:

Carding	$11,990.75
Spinning	5,659.15
Spooling	1,605.45
Winding	1,044.80
Twisting	1,562.60
Beaming	205.85
Weaving	776.60
Inspecting	193.80
Outside	2,645.70

The Reply

Mills running on tire fabrics have the decided advantage of a simple control method. The problem is to present the management with a statement from which anyone, even without knowledge of technicalities, can see the true status of the mill at a glance; in other words, a statement for a board of directors. Such a statement (Form 15) must show the amount expended on material, labor, burden; also production of the various departments, waste on hand and sold, quantity of sales, and actual cost. Besides all the above, it should distinctly show the various factors for each department.

There is a discrepancy in the cotton used and the sum of the sales, waste and inventory, as given by the inquirer; for this reason the total of the latter items has been used as the basis for the calculations in this reply, making no allowance for invisible shrinkage or gain, which, of course, is present in every mill, as no account can be kept close enough to overcome this factor. This invisible loss or gain should be added or deducted from the spinning room production, and will increase or decrease the unit cost of the article accordingly.

The nature of such invisible losses or gains needs discussion. A shrinkage in the weight of material is seldom the chief cause, especially in modern cotton mills where the humidity is regulated. It is rather the result of inaccurate recording of weights of material during processes, also of the waste made and inventory of stock. The same thing stands for an invisible gain. Neither possibility should exceed the normal one or two per cent; and if the difference is greater, under no circumstances should it be added or deducted from the cost, but no effort should be spared to find the cause of discrepancy.

If the records have been checked and found correct, the management may rest assured that the missing or gained material is either in the form of waste or as inventory stock on hand. Among the writer's experiences is the case where a scale out of

	Weight of Cotton	Value of Cotton	Direct Labor	Burden	Gross Cost	% of Waste	Waste in Lbs.	Waste Value	Net Cost	Unit Cost	Inventory Lbs.	Inventory Value	Lbs. Sold
Cotton taken from Warehouse @$0.30	369,613	110,883.90											
Bagging and Ties @$0.06							5,096	306.58					
Inventory Laps, Card Room @$0.30											3,541	2,562.30	
Cotton Sent Thru Card Room @$0.30	355,979	106,793.70											
Cost of Carding Labor			11,990.75										
Carding Burden				1,322.85	120,107.30								
Card Waste on Hand and Proceeds of Sales Value per Lb. $0.20							83,969	16,653.80					
Card Room Production	278,710	106,793.70	11,990.75	1,322.85	120,107.30	29%	83,964	16,960.38	103,146.92	.37885	51,712	18,890.87	
Cotton to Spinning Room $0.37823	289,539	86,819.85											
Cost of Spinning Labor			5,659.15										
Spinning Burden				661.45	93,139.93								
Single Yarn Waste on Hand and Proceeds of Sales, Value per Lb. $0.10							2,899	289.90					
Spinning Room Production	286,640	86,819.85	5,659.15	661.45	93,139.93	1%	2,899	289.90	92,850.03	.40963	27,116	11,109.16	133,190
Cotton taken from Twisting Room	66,404	27,905.06											
Cost of Spooling, Winding, Twisting, and Beaming Labor			4,418.70										
Burden of Same				396.86	32,020.62								
Twisted Yarn Waste on Hand and Proceeds of Sales, Value per lb. $0.09							2,702	162.16					
Preparatory Room Production	63,702	27,905.06	4,418.70	396.86	32,020.62	4¼%	2,702	162.16	31,858.50	.50013	14,996	7,404.79	
Cotton taken to Weaving	43,776	24,393.71											
Cost of Weaving and Inspecting Labor			970.40										
Weaving and Inspecting Burden				264.57	25,628.68								
Weaving Production	43,776	24,393.71	970.40	264.57	25,628.68				25,628.68	.52545	932	116.65	43,554
Totals for the Period	369,613	110,883.90	23,039	2,645.70	136,568.60	5¼%	93,966	17,412.44	119,156.16		93976	37,581.47	181,674

Form 15. Statement of Production and Cost in a Tire Fabric Mill, suitable to be submitted to Directors.

balance was the cause of an excessive showing of invisible loss. This is quite a possibility, so testing all the scales of the mill every week or so is a good precaution which might prevent many shrinkages and gains.

In instances where all checks fail to discover the cause, an invisible shrinkage, considered normal by the management, should be added to the cost and the difference carried into the profit and loss account, as there is every chance that this season's loss will turn out the coming season as a mysterious gain, and thus a balance will be possible; provided the management enforces a careful weighing and recording of the product.

Now a few words about the technical construction of the statement. The statement should be constructed to show the factors from step to step in each department. This requires a departmental distribution of burden, the reason for which has been explained in previous articles. It should be borne in mind that gross cost is the material, labor and burden, in relation to the amount of the product from which waste has not been deducted; and net cost is the above gross cost, from which the value of the waste made in the department has been deducted.

The unit cost should be computed from the net cost. All quantities and values of the statement must balance with the respective accounts of the mill. It will be observed that bagging and ties were deducted at the beginning of the accompanying statement and charged to the waste column. No bagging enters the manufacturing processes, so it has no share of labor and burden. The same statement is true of the inventory of cotton laps in the card room; this is charged directly to the inventory column as their share of labor is negligible.

As in this instance, the mill sells yarn as well as fabric, the administrative and selling burden should be computed for both articles separately, otherwise the net profits on each article cannot be computed with accuracy.

For the present instance, weaving has been divided into two sections, preparatory (including spooling, winding, twisting and beaming) and weaving (including weaving and inspecting). All twisted waste has been charged to the preparatory processes, as no weaving labor is connected with this waste. This is also the reason why no waste is charged for the weaving department in the statement. Should fabrics be spoiled, this, of course, should be charged to weaving waste.

In reference to the question of using Arizona cotton, the solution is the same as the above, but, of course, the statement should show the cost of production for each grade.

CHAPTER IX

THE CONTROL ACCOUNTS OF A MODERN COST CONTROL ORGANIZATION

Manufacturing is a business proposition, and a manufacturer must of necessity measure all values in dollars and cents. Records alone are but carriers of data for the accounts, which tell the final story provided they are well constructed and represent the true condition of affairs.

Many manufacturers claim that the modern cost control system is undesirable on account of its red tape. This claim is quite true if the system is constructed on over-exacting lines. But under all circumstances it requires painstaking accuracy and care. There is no function of greater importance connected with manufacturing than the knowledge as to whether the business is being run on right lines, and is profitable today, rather than at the end of the season when a remedy is too late.

The construction of accounts is by no means an easy task; it requires thought and an exact knowledge of the ultimate purpose, haste being worse than waste. The ultimate end to be attained should be constantly before the eye and all accounts and forms, and in fact the whole system should be so constructed so as to serve this final aim. Accounts must be developed before a single form or record is constructed. Therefore, the correct procedure should be to start at the goal and work backward.

The goal is represented by the monthly statement of the assets and liabilities of the business plus the profit and loss

statement, which should show the profit made on goods manufactured and billed during the month, also into what channels the various units of cost have been sent.

A standard form of the statement of assets and liabilities and of profit and loss is given in the illustrations. (Form 16.)

FORM OF MONTHLY BALANCE SHEET

ASSETS

Current Assets:		
Cash in Bank	$00,000.00	
Cash on Hand	000.00	
Bills Receivable	0,000.00	
Accounts Receivable	00,000.00	
Raw Materials, Supplies, Work in Process and Finished Product in Stock	00,000.00	
TOTAL CURRENT ASSETS		$00,000.00
Deferred to Future Operations:		
Insurance Unexpired	$000.00	
Interest	000.00	
		0,000.00
Fixed Assets:		
Real Estate, Plant, etc.	$000,000.00	
Less Reserve for Depreciation	00,000.00	
		000,000.00
TOTAL ASSETS		$000,000.00

LIABILITIES AND CAPITAL

Current Liabilities:		
Notes Payable	$0,000.00	
Accounts Payable	00,000.00	
Accrued Payroll	000.00	
Accrued Taxes	000.00	
Due to Agents	000.00	
TOTAL CURRENT LIABILITIES		$00,000.00
Capital Stock	$000,000.00	
Surplus	00,000.00	
Reserves	00,000.00	
Income for Month	0,000.00	
		$000,000.00
TOTAL LIABILITIES AND CAPITAL		$000,000.00

STATEMENT OF MONTHLY SALES

Article A:			
Net Sales	$0,000.00		
Cost of Sales	0,000.00		
Gross Profit		$0,000.00	
Article B:			
Net Sales	0,000.00		
Cost of Sales	0,000.00		
Gross Profit		0,000.00	
Article C:			
Net Sales	0,000.00		
Cost of Sales	0,000.00		
Gross Profit		0,000.00	
Sale of Waste		000.00	
Sales of Remnants		000.00	
		$0,000.00	
DEDUCTIONS			
Allowances	$000.00		
Discounts on Sales	000.00	0,000.00	
Gross Profit on Sales			$0,000.00
Selling Expenses:			
Commissions	$0,000.00		
Freight Expense Outward	000.00		
Stationery and Printing	00.00		
Traveling Expenses	000.00		
Advertising	00.00		
Postage	0.00		
Telephone, Telegrams	00.00		
Total Selling Expense	$0,000.00		
General and Administrative Expense:			
Salaries of Officers	$0,000.00		
Salaries of Office	000.00		
Stationery and Printing	00.00		
Postage	0.00		
Telephone and Telegraph	00.00		
Miscellaneous Expense	00.00		
Total Administrative Expense	0,000.00		
Total Selling and Administrative Expense		$0,000.00	
Net Profit on Sales			$0,000.00
Other Income:			
Interest Charged to Cost	$000.00		
Interest on Notes Receivable	00.00		
Interest on Bank Balance	00.00		
Income from Sources Other Than Sales	00.00		
		000.00	
Deductions on Income:			
Interest Payable		000.00	
NET INCOME			$0,000.00

Form 16

It must be emphasized that these two statements are the pivots of the whole system. It is not necessary to dwell too much on purchase and sales ledgers, cash books and journals, or whether a loose leaf or a card system is to be used, these being matters of personal choice, but rather to describe the accounts which lead ultimately to the profit and loss statement.

Production and Operating Accounts

For the construction of a cost control system, all accounts that reflect the activities and changes during manufacturing, or that are concerned with the production of the goods, must be grouped forming the Production Accounts. Accounts concerned with sales and general administration are known as Operating Accounts. The former constitute the Production Ledger, and the latter the Operating Ledger. The number of accounts and their divisions must necessarily vary with the requirements of each mill, but they embrace the following:

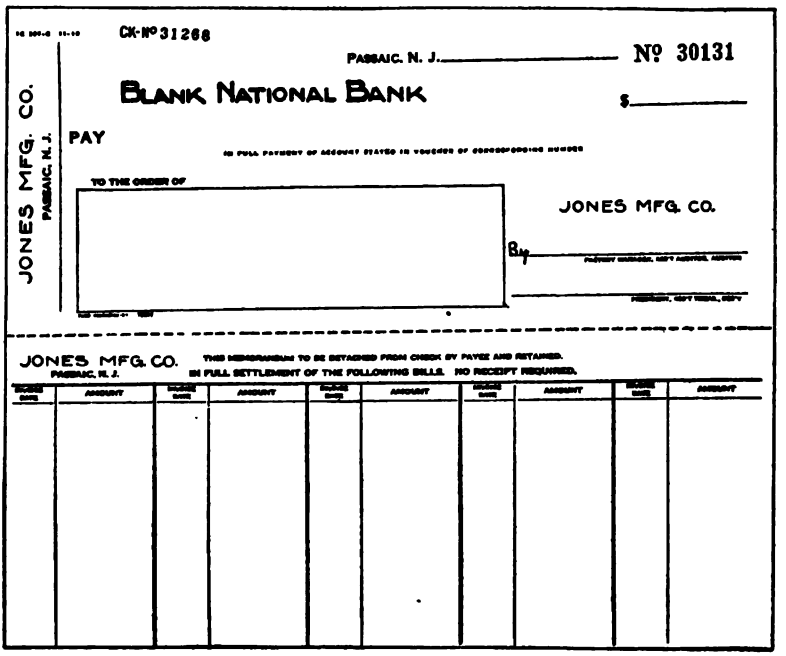
Production Ledger—
- Raw Materials
- Supplies
- Manufacturing Expenses
- General Expenses, in reference to production
- Departmental Control Accounts

Operating Ledger—
- Administration and General Expenses
- Sales
- Cost of Sales (controlling production ledger)
- Selling Expenses

Thus we arrive at the most important function of cost control organization; that is, determining what these accounts should reflect at the end of the month and the method of obtaining the proper records in such a manner that they serve their purpose without overburdening the management with un-

necessary clerical work. After this has been decided, the construction of all mill records, stock ledgers and production reports are but a matter of technicality.

Since the accounts determine the method of obtaining information, all questions regarding such information should be decided at the same time. Analyze the requirements; compare


CK-Nº 31268

PASSAIC, N. J. Nº 30131

BLANK NATIONAL BANK $

JONES MFG. CO. PASSAIC, N. J.

PAY

TO THE ORDER OF

JONES MFG. CO.

By

JONES MFG. CO. PASSAIC, N. J.

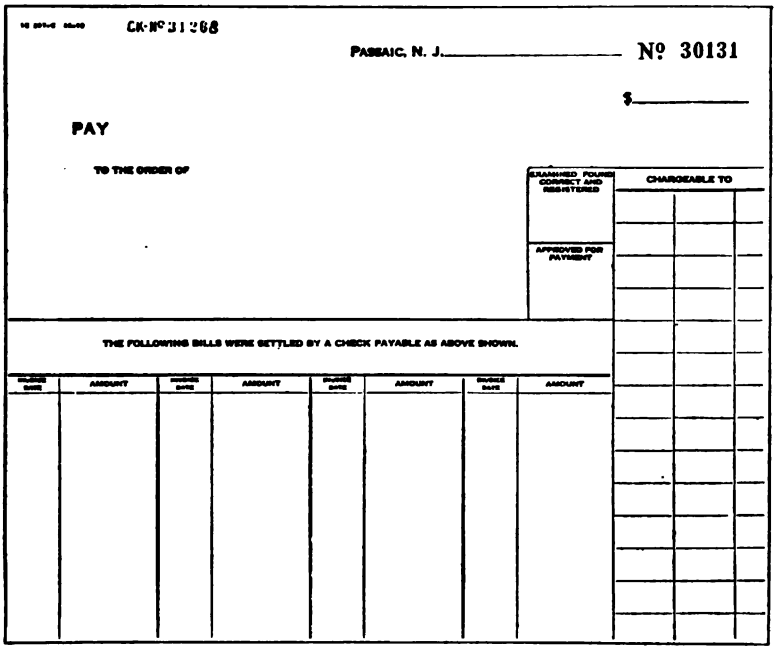
IN FULL SETTLEMENT OF THE FOLLOWING BILLS. NO RECEIPT REQUIRED.

Form 17. Voucher Check

them with prevailing conditions in the mill, and if the proposed solution gives assurance that the information will be dependable and will not impose hardships on the organization, then the procedure is right. In a nutshell: determine first what is needed, then find the best way of obtaining it.

Now let us consider the sources of all information. All transactions originating from the *outside* must be connected

with some monetary transaction, either as a charge or as a credit. So all transactions with an outside source *must* be recorded in the cash journal either as credit or debit. As every transaction must have a connecting line to some factor of production or sale, and if all transactions appearing in the cash journal are *charged* to an account or group of ac-


CK-№ 31268

PASSAIC, N. J. _____ № 30131

$_____

PAY

TO THE ORDER OF

EXAMINED, POWER CORRECT AND REGISTERED

APPROVED FOR PAYMENT

CHARGEABLE TO

THE FOLLOWING BILLS WERE SETTLED BY A CHECK PAYABLE AS ABOVE SHOWN.

	AMOUNT		AMOUNT		AMOUNT		AMOUNT

Form 18. Voucher

counts representing the production factors of the mill, the ultimate result will be that such accounts will reflect in detail changes in the production and its cost.

But this is only half the task. We must decide in each instance, what *inside* information will be essential to show the final disposition of all these outside factors, and to create records to supply such information. This will be the last task; record construction.

The first step is to make provisions for information originating from the outside. To post each transaction would involve a clerical task of such magnitude as to make any management shirk from the undertaking. Accounting ingenuity has fortunately developed devices to overcome this difficulty. All that we are interested in are the *totals of the transactions,* so if we make provisions for the various groups of cost factors their respective totals at the end of the month provide the wanted information.

Such important instruments in connection with modern cost control systems are the improved Voucher (Form 17), Voucher Check (Form 18), and Voucher Register (Form 19). Without these it is necessary to journalize every item of purchase and analyze the Journal at the end of the month.

Every mill has certain dates for the payment of invoices on purchases. With the help of the Voucher and Voucher Check, all goods coming from the same source and within one payment period are recorded. The accounts of the Production Ledger are registered on the Voucher and the invoices attached to this Voucher. This Voucher may be made in envelope form to carry all invoices, or on a card to which the invoices are attached. At the end of the payment period all such Voucher Checks are closed, the check drawn for the total amount, and after the payment has been made the entry is made in the Voucher Register.

The Voucher Register carries divisions corresponding with the various Production and Operating Ledger Accounts and the total amount of the check is divided into the proper accounts to which they are to be charged. At the end of the month these account columns are added up and the journalization as well as the distribution to the accounts is made at one time. Thus the work that otherwise would be almost impossible is done with hardly more labor than with ordinary methods which give no base for a cost control system.

Date	Voucher No.	In Favor of	Particulars	Date Paid	Date Payable	Credits: Freight	Discount	Allowance	Gen'l Ledger: Acc't No.	Amount
Jan. 3	1	Burn Coal Co.	Coal	1 9	1918 1 10				316	357 10
" 3	2	N. E. Woolen Co.	Yarn	1 9	1 10		18 63		215	931 50
" 3	3	Lead Mfg. Co.	Mach. Shop	1 9	1 10		26		200	13 11
" 4	4	Miller & White	Dyes	1 9	1 10	2 10	2 27		221	115 62
" 4	5	Wotan Fire Ins. Co.	Insurance	1 9	1 10				110	22 10
" 4	6	Gem Press	Stationery	1 9	1 10		63		217	32 15

(Left side)

Stock Ledger: Raw Material Acct. No.	Raw Material Amount	Supplies Acct. No.	Supplies Amount	Production Ledger: Expenses Acct. No.	Expenses Amount	Gen. Expenses Acct. No.	Gen. Expenses Amount	Operating Ledger: Administration Acct. No.	Administration Amount	Selling Acct. No.	Selling Amount	Acct. No.	Amount
		27	357 10										
7	931 50												
		31	13 11										
11	115 62												
								71	82 10				
						119	32 15						

(Right side)

Form 19. Voucher Register

The posting of the individual charges is now greatly simplified. The illustrations represent one of the well known and frequently used forms, but there is still a possibility of reducing clerical labor. The "accounts" division of the voucher can be made detachable, each slip representing one charge to an account. A pigeon hole arrangement, one for each account, is used for collecting these individual charge slips, the total of each being charged to the accounts once a

Month of *January* 19*18*

CHARGE SHEET: Material, Production and Operating Accounts

ACCT. NO.		ACCOUNT	# OF CHGS	AMOUNT		ACCT. NO.		ACCOUNT	# OF CHGS	AMOUNT	
1	a	Carded Cotton	19	14,192	10	51		Telephone	1	13	15
1	b	Merc. Cotton	7	2,745	33	52		Fire Insurance	1	81	10
1	c	Worsted	11	5,740	05	53		Accident "	1	203	45
1	d	Boxes	3	392	45	54		Life "			
2	a	Mill Supplies	21	851	10	55	a	State Tax			
2	b	Power "	13	298	43	55	b	Town "			

Form 20. Charge Sheet

month. In this case, a Charge Sheet (Form 20) is prepared to be used for the posting, and only one charge posting is required every month for each control account. This same labor-saving system will be taken advantage of for crediting the material and supply accounts with the monthly withdrawals. The charge sheet has a space provided for each account of the Production and Operating ledgers, involving an *outside* transaction.

It is plain now that the upkeep of control accounts, with-

out which proper cost and production control is impossible, is not a task requiring unreasonable clerical outlay. The collective procedures just illustrated will not be too excessive for any organization, and for the results obtained very much worth while.

We are yet at the beginning of the account organization. The general division is already known and the first on the list of the Production Ledger is "Raw Material." This account must show at the end of every month the total value of all raw materials on hand, and it must also show the value of the raw material drawn during the month by the various departments, thus forming the basis for the monthly production cost. This account will be debited (charged) with all raw materials received, and credited with all raw materials withdrawn from the storerooms by the manufacturing departments. It should be borne in mind that the value represented must include all freight, hauling, and other expenses incidental to delivery.

In spite of the immense variety of materials used in the textile industry, in almost every case this account can be divided into four classes of materials as follows:

1. Basic raw materials
2. Dyes and chemicals
3. Sizings
4. Boxings and trimmings.

Each class will have subdivisions, usually designated by letters, as will be seen from the following:

1. *Basic Raw Materials.* This account should be charged only with the original value of raw materials as received from outside sources. If the material goes through any process, thereby increasing in value, it carries a share of direct labor and burden and is no longer basic raw material, but belongs to Semi-Manufactured Goods, a class by itself, which is described with the Controlling Process Accounts. When scouring is

done by an outside concern, the scoured wool is the basic raw material. In the same way, silk thrown by an outside throwster, or yarn dyed by an outside dyer, is also basic raw material. Materials in all forms of advancement (always provided such advancement has been done by an outside concern) will be represented in this account.

2. *Dyes and Chemicals.* This account represents all dyes, chemicals and kindred materials and carries the subdivisions of (a) dyes, (b) chemicals, (c) soaps, (d) starches and finishes.

3. *Sizings.* All sizings used in warp preparing processes.

4. *Boxings and Trimmings.* This account is used for sundry articles needed during manufacture, and is subdivided into (a) tubes and cones, (b) spools, (c) labels, (d) boxes, (e) wrapping paper, (f) twines and ribbons, (g) thread, (h) buttons, (k) laces, (l) linings. It should be remembered that boxes, wrappings and twines used in connection with the shipping of the goods do not belong to this division.

With the above four general divisions the Production Ledger Basic Material Accounts for any branch of the textile industry can easily be constructed as shown in the table. (Form 21.) In explanation of this, take for instance the first item under "For Cotton Industry," which is "Spinning—1, 4 (a)." The figure 1 represents basic raw material (raw cotton), while 4 (a) represents tubes and cones.

At the end of each month, through the proper subdivisions, information will be at hand as to how much of each kind of raw material has been used and the total value.

Accounts, besides their defined name, must have an identification number or letter, forming groups of accounts of the same character. "Raw Materials" will form the first group in the Production Ledger, and so the first ten numbers will be reserved for raw materials. In assigning groups, care should

be taken to provide for possible future additions and sufficient reserve numbers left for this purpose. To make the illustra-

TABLE SHOWING CONSTRUCTION OF PRODUCTION LEDGER BASIC MATERIAL ACCOUNTS

Branch of the Industry.	Division.
FOR COTTON INDUSTRY	
Spinning.	1, 4 (a).
Spinning and dyeing.	1, 2 (a, b), 4 (a).
Thread manufacturing.	1. 2 (a, b, d), 4 (a, b, c, d, e, f).
Weaving.	1, 3.
Spinning, weaving, dyeing.	1, 2 (a, b, c, d), 3.
Spinning, weaving.	1, 3.
Spinning, weaving, dyeing, printing, finishing.	1, 2 (a, b, c, d), 3, 4 (c, d, e, f).
FOR WOOLEN AND WORSTED INDUSTRIES	
Spinning.	1, 2 (b, c), 4 (a, e, f).
Spinning and dyeing.	1, 2 (a, b, c), 4 (a, e, f).
Spinning, dyeing, finishing for retail consumption.	1, 2 (a, b, c), 4 (a, b, c, d, e, f).
Weaving.	1, 3.
Spinning and weaving.	1, 2 (b, c), 3.
Spinning, weaving, dyeing, printing, finishing.	1, 2 (a, b, c, d), 3, 4 (c, e, f).
FOR SILK INDUSTRY	
Throwing.	1, 2 (c).
Thread manufacturing.	1, 2 (a, b, c), 4 (a, b, c, d, e, f).
Weaving.	1.
Throwing and weaving.	1, 2 (c).
Throwing, dyeing, weaving, printing, finishing.	1, 2 (a, b, c, d), 4 (c, d, e, f).
FOR HOSIERY INDUSTRY	
Knitting, dyeing, finishing.	1, 2 (a, b, c), 4 (c, d, e, f).
FOR UNDERWEAR AND SWEATER INDUSTRY	
Knitting, dyeing, finishing.	1, 2 (a, b, c), 4 (c, d, e, f, g, h, k, l).

Form 21

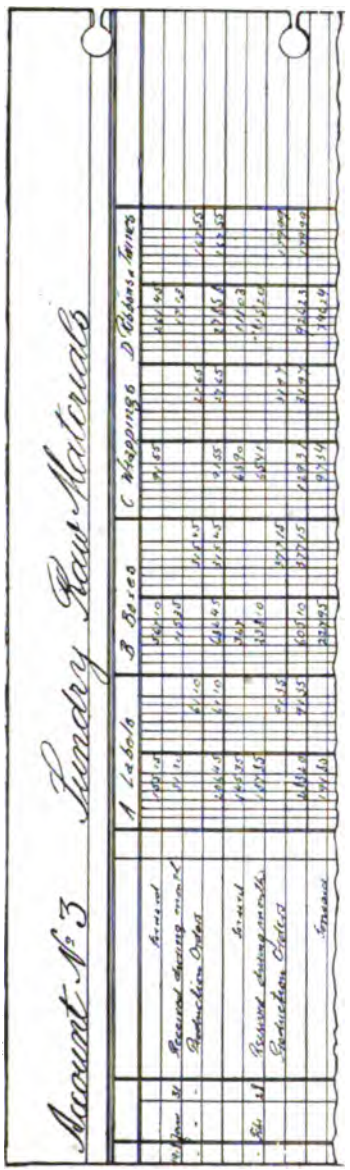
tion concrete, it is presumed that the accounts of an underwear plant making its own yarn are under consideration and the accounts will be according to the previous index table:

Account No. 1. Cotton
Account No. 2a. Dyes
Account No. 2b. Chemicals
Account No. 2c. Soaps
Account No. 3a. Labels
Account No. 3b. Boxes
Account No. 3c. Wrappings
Account No. 3d. Ribbons and Twines
Account No. 3e. Sewing Threads
Account No. 3f. Buttons
Account No. 3g. Laces
Account No. 3h. Linings

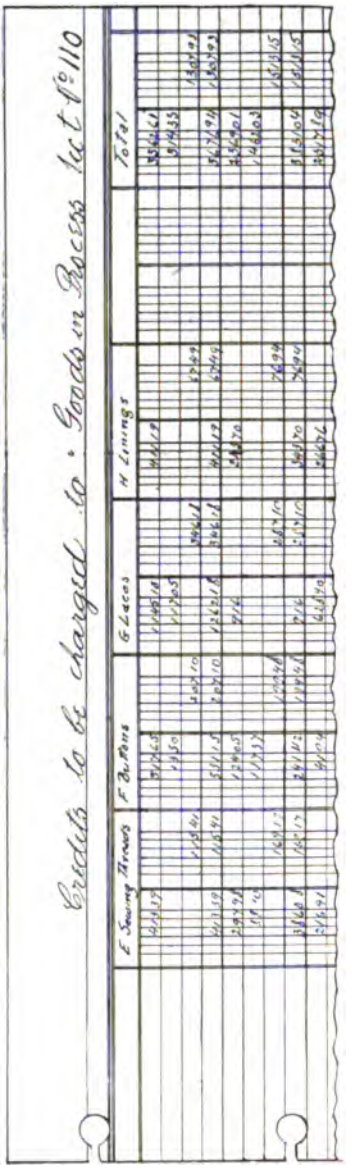
All accounts of the same number will be on one page. Such collective ledger sheets are for sale in every stationery store and the entries are most conveniently arranged in the manner illustrated in Form 22. The heading carries the account number and its classification, also designating to which account the credits are to be charged at the end of the month. Such arrangement will be greatly responsible for the efficient and sure working of the system. The illustration is closed for two months, taking advantage of the "one posting a month" method described previously. All control accounts are handled in similar manner.

The procedure for the credits on the raw material accounts now needs discussion. This is done through the production order or other form of requisition for raw materials, which will necessarily vary with the nature of the business as well as that of the raw material. The records and methods will be discussed in their proper chapter.

The Stock Ledgers which are in charge of a stockkeeper show in detail all transactions of the various materials. The requisitions for materials given out are filed according to account numbers after being priced, and at the end of the month all requisitions are sent to the office to be totaled.



Form 22. Production Ledger, left side



Form 22. Production Ledger, right side

These totals now represent the values of stock withdrawn from various accounts and as such are credited in the account. A "Monthly Credit Sheet" (Form 23) is prepared from these requisitions to facilitate postings.

Month of.....*19*....

CREDIT for withdrawals the following Raw Material Accounts:

ACCOUNT #		ACCOUNT	# OF CREDITS	AMOUNT	
1		*Cotton*			
2	*a*	*Dyes*			
2	*b*	*Chemicals*			
2	*c*	*Soaps*			
2	*d*	*Starches*			
3		*Sizings*			
4	*a*	*Labels*			
4	*b*	*Wrappings*			
4	*c*	*Twines, Ribbons*			
TOTAL					

CHARGE total to *"Goods in Process,"* Account #110.

Form 23. Monthly Credit Sheet of Materials Withdrawn from Stores

Accordingly we create in the Production Ledger:

Goods in Process Account No. 110a Carding
Goods in Process Account No. 110b Spinning
Goods in Process Account No. 110c Warping
Goods in Process Account No. 110d Weaving
Goods in Process Account No. 110e Finishing

For other branches of the industry these subdivisions are made to suit the processes decided as the most desirable for departmental divisions.

This concludes the Raw Material Accounts and the next item of the Production Ledger will be "Supplies."

In the Chapter on Departmental Burden, the method of handling and charging supplies has been fully discussed. Supplies are always charged to the burden of the department responsible for their use, *at the time of their use.* This means that all supplies must be carried in a supply stock room the same as raw materials, *given out on requisition when actually needed for use,* and the reserve stock forming an asset like that of raw material stock. The actual monthly withdrawals form a part of the burden of the department responsible for them.

The supply account of the production ledger will be divided into sub-accounts to represent the various groups, to supply the management with a clear statement as to the value of stocks in each group.

These are the most probable groups of supply accounts in the textile industry:

Manufacturing Supplies

Some materials used exclusively in the manufacturing processes cannot be properly classified as Material, yet are so closely connected with manufacturing that they form a distinct group, known as Manufacturing Supplies. The character of these articles varies with every mill, but the list that follows will sufficiently illustrate the supplies generally belonging to this group:

Cans and boxes used in moving materials.
Marking inks and chalks.
Spools and bobbins used in spinning, twisting and weaving.

Paper used in knitting mill cutting room.
Form boards.
Jacquard card boards.
Needles used in mending room.

To determine what merchandise comes under this classification, go over last year's bills and make memoranda of all merchandise of such character. It is not necessary to subdivide these accounts into articles as the Manufacturing Supply Stock Ledgers will show all details of all transactions, otherwise the procedure is the same as for Basic Raw Materials.

Machinery Parts and Supplies

Hardly any other industry carries such a large stock of machinery parts and supplies as the textile industry. Because of this, every mill is in danger of overstocking machinery supplies unless the stock is controlled to the greatest extent. In one instance during investigation it was found that there was sufficient belting of one size in stock to last for twenty years. In another instance it was found that there were more tacks used in one weaving department of 50 looms than in another one of 300 looms.

One mill carried for twenty years brand new loom parts valued at $3,000 for looms that had been taken out years ago. Instances of this character would fill a book and nearly every mill man can recollect in his own experience cases of abuse of machinery parts and supplies. Thus no control can be too rigid that proves to be profitable to the mill.

The Production Ledger, Machinery Supply and Parts Account should be subdivided into general departmental divisions. Carding, Spinning, Quilling, Dressing, Weaving, Finishing, Power, Repair, General.

In larger mills the above may be sub-divided: as for a spinning mill into Roll Coverings, Flyers, Rings, Bands, Miscellaneous.

Or in a large weave shed into Shuttles, Strapping, Heddles, Vibrators, Miscellaneous.

Every knitting mill's Machinery Parts and Supplies Account should have a needle sub-account.

As to what constitutes Machinery Parts and Supply Account, it may be said that this includes everything that goes on a machine from tacks to sandpaper, harness straps and vibrators, bands and beltings, card clothing, rubber aprons, tension strings, sinker heads; everything that belongs to a machine. Fortunate is the manager who has a properly kept Machine Part and Supply Account; he carries a policy against one of the greatest and the most frequent abuses of the industry, the waste of machine parts and supplies.

General Factory Supplies

Even mills of moderate size are doing well by opening this account for the various odds and ends which cannot be placed properly into any of the above accounts. In many mills, brooms, brushes, towels, etc., used by all departments form too important an item to be lumped in with some nondescript account. However, for plants of smaller size these items may be included in Manufacturing Supplies, but nevertheless a sub-account should be opened to show the monthly consumption of articles of such character..

Building Supplies

In plants where extensive buildings require considerable building material to be kept on hand, such an account is imperative. For smaller plants the general factory supply account may carry a subdivision for Building Supplies.

Shipping Room Supplies

Shipping room supplies form quite an important item in every textile mill, and for this reason a distinct account in the

Production Ledger is essential. The Shipping Room Supply Account should be subdivided into Boxes, Baggings, Paper Twines, Miscellaneous.

Power, Light and Heat Supplies

In this account all supplies referring to the above cost factor exclusively are carried. Such items are coal, belting used exclusively for power transmission purposes, motor supplies and other kindred articles. The one article where the control may seem difficult is coal. However, there are various simple yet correct ways of checking the monthly consumption. Here is the description of one simple and well tried method.

Determine the net weight of an average wheelbarrow load of coal. Install at the door of the boiler room used for bringing in the coal a counter, similar to the one used on looms or other machines. The fireman is to be instructed to pull the lever every time he leaves with the wheelbarrow for coal. The readings at the end of the day are taken by the engineer and sent to the stock clerk, who keeps a coal sheet similar to any supply stock sheet and deducts the daily consumption. The record is kept in tons and decimal fractions of tons and the weight of a wheelbarrow full of coal is computed in the same manner. For instance, if the average load is 145 pounds, the multiple factor will be .0725, using the short ton measure as a unit. Twenty wheelbarrows will mean, therefore, 1.45 tons of coal consumption. In large plants with automatic stokers, the consumption is obtained mechanically, but every engineer is capable of devising some simple and dependable method for control of daily consumption.

Machine Shop Supplies

Mills possessing a machine shop will find it worth while to keep a distinct supply account of this character. This includes the regular run of machine shop goods, such as sheet

and bar iron, wires, tubings, bolts, nuts, pipings and other wares of similar character.

Stationery and Printing Supplies

The stationery required in a modern plant requires rigid control and often it is found advisable to have a supply account for this item of expense.

These are the classifications of the supply accounts of the production ledger, and we can proceed with the creation of the accounts, presuming for this case the requirements of a woolen mill, so we will have—

SUPPLY ACCOUNTS, PRODUCTION LEDGER

Account No.	11	Manufacturing Supplies
Account No.	12a	Machinery Supplies, Carding
Account No.	12b	Machinery Supplies, Spinning
Account No.	12c	Machinery Supplies, Warping and Preparing
Account No.	12d	Machinery Supplies, Weaving
Account No.	12e	Machinery Supplies, Finishing
Account No.	13	General Factory Supplies
Account No.	14	Building Supplies
Account No.	15	Shipping Room Supplies
Account No.	16	Power, Light and Heat Supplies
Account No.	17	Machine Shop Supplies
Account No.	18	Stationery and Printing Supplies

Charges to the accounts are made once at the end of the month from the charge sheet described in connection with the voucher system, and the credits are made from the supply credit sheet prepared from the individual requisitions after the stock records of the supplies are credited. The stock records and their treatment will be described under the Records Chapter and for the present we will presume that this has been done

and the individual requisitions are filed according to supply account numbers and subdivided according to the departments responsible for the withdrawals. From this data, at the end of the month a Supply Credit Sheet is prepared in the manner which will now be described.

In the chapter on burden the various burden factors were discussed. Each burden account during the month will be responsible for some kind of a supply to which it should be charged at the end of the month. Presuming that this record is prepared for a cotton mill, the factors requiring an account will be:

Manufacturing Departmental Burdens, such as

- Carding Burden
- Spinning Burden
- Warping Burden
- Weaving Burden
- Finishing Burden

Distributed Burdens, like

- Power, Light and Heat
- Rental
- Machine Shop
- Store Room
- Stock Room
- Shipping Room
- Office
- Welfare

Finally, some supplies not otherwise chargeable will form a part of the Monthly General Burden. Let us now consider the above factors carefully. Power, Light and Heat; Rental; Machine Shop; are *interlocking factors,* a portion of each depending on the others, and finally to be distributed among all the other above factors, besides directly into General Burden.

For this reason these accounts will form part of both the productive group and operating group. Since the accounts themselves will be absorbed ultimately at the end of each month and are used only to accumulate the cost factors, for the sake of simplicity, they will be classed under the production group.

This introduces two new definitions—Accounts like

Power, Light and Heat
Rental
Machine Shop
Store Room
Stock Room
Shipping Room
Office
Welfare

also Depreciation
Interest
Sundry Expenses
Insurances
Productive Labor
Non-Productive Labor
Wages
Salaries

are *accumulative accounts,* because during the control they accumulate the kindred cost factors in order to be distributed among other accounts forming the units of the control system. Such are

Goods in Process
Departmental Burden
General Burden
Selling Burden

because they absorb ultimately all the Accumulative Accounts; this group is defined now as the *absorbing accounts.*

The accounts of either group may be Production or Operating Accounts with the exception of the ones of the interlocking character which, as stated previously, are classified under the Production group.

We can proceed now with the classification of the cost factors into which the various supplies have been absorbed. Upon consideration it will be found that all with the exception of

Store Room
Stock Room
Shipping Room
Office
Welfare
General Burden

belong to the Production Ledger, while this latter group belongs to the Operating Ledger.

Accordingly we create accounts for them, using a wide range of numbers to make provisions for possible intermediate factors, and will then have:

PRODUCTION LEDGER ACCOUNTS

Account No. 80 Carding Burden
Account No. 81 Spinning Burden
Account No. 82 Warping Burden
Account No. 83 Weaving Burden
Account No. 84 Finishing Burden
Account No. 100 Power, Light and Heat
Account No. 101 Rental
Account No. 102 Maintenance (Machine Shop)

OPERATING LEDGER ACCOUNTS

Account No. 130 Store Room
Account No. 131 Stock Room

Account No. 132 Shipping Room
Account No. 133 Office
Account No. 134 Welfare
Account No. 151 General Burden

These accounts will have to be charged with the withdrawals of supplies and accordingly the Monthly Supply Credit and Charge Sheet will be constructed as illustrated. (Form 24.)

Such distribution sheets are printed with all particulars and only the amounts are inserted. Since all data of charges and credits are filed according to their right division, the task at the end of the month is nothing more than the addition and filling out of the respective columns of the distribution sheet. The posting of the items to their proper control accounts with such preparation is quick work. Finally, all such reports and distribution sheets are placed in a binder, one for each month, and submitted to the manager, who by spending an hour or two with these records will obtain more inside knowledge and information about the running of the plant than he would by spending all his time observing the operation of each department.

Another phase of material control to be considered before we can turn to the expenses of manufacturing is the waste and its control. During the month every department produced a certain quantity of waste, which increased the cost of materials, but at the same time the value of such wastes has been credited to "Goods in Process" to which in turn the cost of all raw materials given to production during the month has been charged.

The factory records will, therefore, provide that all wastes collected during the month be reported according to the grades and at the end of the month a summary of these reports, known as Monthly Record of Waste Distribution (Form 25), will be prepared and form the basis for the waste calculations.

Credit and Charges of Supplies

Month of *January*, 19 *20*

CREDIT; Accounts					CHARGE; Accounts with Totals																																			
ACCOUNT NO.		ACCOUNT	NO. OF CREDITS	AMOUNT	ACCOUNT 80 CARDING BURDEN		ACCOUNT 81 SPINNING BURDEN		ACCOUNT 82 WARPING BURDEN		ACCOUNT 83 WEAVING BURDEN		ACCOUNT 84 FINISHING BURDEN		ACCOUNT 151 GENERAL BURDEN		ACCOUNT 100 POWER, LIGHT & HEAT		ACCOUNT 101 RENTAL		ACC'T 102 MAINTENANCE (MACHINE SHOP)		ACCOUNT 130 STORE ROOM		ACCOUNT 131 STOCK ROOM		ACCOUNT 132 SHIPPING ROOM		ACCOUNT 133 OFFICE		ACCOUNT 134 WELFARE										
11		*Manufacturing Supplies*	73	467 15	93	07	78	96	18	23	165	06	111	85																										
12	a	*Machine Carding* "	11	61 55	61	55																																		
12	b	" *Spinning* "	27	83 37			83	37																																
12	c	" *Warping* "	19	31 10					31	10																														
12	d	" *Weaving* "	109	228 73							228	73																												
12	e	" *Finishing* "	10	7 09									7	09																										
13		*General Factory* "	71	93 67	6	43	8	39	1	83	12	12	6	67	12	63	2	10	20	70	2	84											14	06					
14		*Building* "	8	7 45															7	45																			
15		*Shipping* "	15	93 34																									93	34									
16		*Power, Light & Heat* "	27	387 40													387	40																					
17		*Machine Shop* "	48	210 11																	210	11																	
18		*Stationery & Printing*	69	67 13	1	70	2	28	1	55	3	45	2	86			1	07			1	25	4	05	4	14	5	72	25	51	3	59							
		Totals		1728 09	162	75	172	99	52	71	409	33	128	37	18	63	390	57	28	15	214	18	4	05	4	14	99	06	25	51	17	65							

Form 24. Monthly Supply Credit and Charge Sheet

We will open, therefore, a waste account, subdivided into grades to suit conditions, and at the end of the month, based on the report, will charge these accounts with the values of the wastes. When waste is sold, this waste account, of course, will be credited with the proceeds of the sales. So now we open the following accounts, using as an example a cotton mill:

Account No. 21a Bagging and Ties
Account No. 21b Card Waste
Account No. 21c Comber Waste
Account No. 21d Spinning Waste
Account No. 21e Warping Waste
Account No. 21f Weaving Waste
Account No. 22 Sales of Wastes

The monthly distribution sheet provides for much other very important information.

Through the production records it will be known at the end of the month what material went into the departments and what was taken out. The records will also tell what lots are on the machines and on the floors. This permits the computation of the total departmental waste, and this item deducted from the waste collected during the month supplies the very interesting and important factor, the *invisible waste*. From these factors the percentages are easily computed, as well as what credit should be given in the cost records for the waste in the various departments. The results of such reports are too instructive to be left out of a well organized control system. The general construction is the same; the details must be changed to suit the specific purpose of the business.

For cotton and woolen manufacturing, the form is almost identical. If a distinction is desirable between various grades of raw materials or colors, this can be easily done.

The divisions for a throwing plant will be winding, doubling, spinning and twisting, and reeling. The specifications may be Tram, Organzine, Crepe, etc.

Waste Distribution — Month of January, 19 20

Waste	Charge to Waste Accounts: Lbs.	Value	Amount		Values: Total Lbs.	Total Value		Particulars: Total Raw Material Charged to Dept	Total Raw Material Credited to Dept	Stock on Machinery and Reserve	Total Departmental Waste	% of Visible Waste	% of Shrinkage	% of Total Waste	% of Regain	Credit Dep't for Waste Value per 1000 lbs.
Bagging and Ties	1760	.03	52	80	1760	52	80	89512	87457		2055	1 96/100%	1/3%	2 1/4%		.605
Motes	1549	.02	30	98												
Card Fly	1110	.03	33	30												
Card Strips	5043	.10	504	30												
Card Sweeps	965	.025	24	13												
Oily Sweeps	210	.015	3	15												
Card Total					8877	595	86	87457	72830	4165	10462	10¼%	1 8/10%	12%		8.15
Combers	16327	.165	2693	96												
Comber Sweeps	420	.025	10	50												
Combers Total					16747	2704	46	72830	52052	3216	17562	25%	1 1/10%	24%		51.60
Spinning Threads	510	.09	45	90												
Spinning Sweeps	485	.025	12	13												
Spinning Total					995	58	03	52052	53117	2450	995	1 9/10%		1 9/10%	2¼%	1.09
Spooler, Warper Thread	300	.09	27	00												
Slasher Thread	165	.06	9	90												
Warping Total					465	36	90	53117	49477	2950	780	9/10%	55/100%	1½%		.75
Filling Waste	525	.09	47	25												
Warp Waste	197	.06	11	82												
Weav Sweeps	210	.025	6	25												
Weaving Total					932	64	32	49477	40670	7472	1245	2%	65/100%	2 2/3%		1.58
Totals	29776		3512	37	29776	3512	37			22253	33069	33 2/10%	3 65/100%	36 85/100%		

Form 25. Monthly Record of Waste Distribution

For a hosiery mill, the divisions can be winding and knitting. The specifications to provide for a separation of cotton, silk, wool, etc., also of white and colors.

For an underwear mill the divisions are winding, knitting and cutting, with consideration for the grades and colors as mentioned above.

The importance of waste in modern manufacturing cannot be over-emphasized; a slight saving might mean more to the increase of profit than extreme efforts directed toward an increase of production. In the past "American Waste" has been notoriously known for its careless treatment on the international waste market. While in the last few years conditions have improved somewhat, yet they are far from the ideal. A great deal of this is due to the deficient methods of control. When at the end of the month a slip of paper showing the total waste in a lump sum is put on the manager's desk, he can do but little with the information. Better information and the better grading of stock will mean better control, better waste prices and more profit.

Accounts for the Control of Human Hire

The cost sheet reproduced at the beginning of the burden chapter is yet serving as the indicator of the cost control organization. We have settled all accounts pertaining to materials and supplies, and we turn now to the expenses caused through the services of human beings. In every mill the records connected with this phase of the cost are known as the "payroll." We retain the name, but the instrument will have to go through some radical changes before it will answer our ultimate purpose. The payroll essentially includes:

Productive or Direct Labor
Non-Productive or Indirect Labor
Wages and Salaries

The two latter may be departmental or general. Some belong to the productive group and others to the operating group of ledger accounts.

The method of payment is itself irregular. In most plants hardly a day goes by without some payment. Among large groups of workers, some leave every day and have to be paid off; others are seeking advance payments; some are paid weekly, some by-weekly and some monthly. In very large plants "one pay day" is a physical impossibility. Organizations where every day some one section is paid are by no means a rarity. This is an excellent plan for large mills, where a force of clerks is constantly employed on the payroll. But here another obstacle presents itself. Our cost control period is one month and payments are made weekly, bi-weekly and monthly, so the week falling between two months will have to be divided into two sections. This would be a very hard task, impractical, and in many mills impossible. To overcome this obstacle, the payroll records will have to be arranged so that all credits due for human service are entered the day after the performance, if the individuals are paid by the piece, day or hour. For all weekly and monthly raters the entries are made at the beginning of the new pay period. At the end of the month, which will fall between pay periods, the amount due up to date is totaled according to departmental divisions, while for the weekly raters the daily equivalent is multiplied by the number of days and totaled up according to departments. For such unpaid payroll the mill is now a debtor to the employes, and accordingly an account will be created under the Liabilities Accounts called "Accruals on Payroll," this account to be credited at the end of the month with such unpaid payroll. Every month a balance statement will be made, and this being an indebtedness it will have to be deducted from the gross income like other bills payable.

The predetermined paydays have to be strictly observed,

and all payments rendered between pay periods shall be drawn from Petty Cash and at the pay periods the advances restored.

The general procedure being decided, we can open the payroll accounts. The classifications in the burden chapters discussed the various kinds of labor, and accordingly we will have accounts for—

Productive Labor (Direct Labor)
Non-Productive Labor (Indirect Labor)
Wages
Salaries

With the exception of the first, which is a direct manufacturing expense, the others may be—

Departmental Burden
General Burden
Selling Burden

Departmental Burden, if connected with the productive departments like Card Room, Weave Shed, Knitting Room, Engine Room, Maintenance, belong to the Production Ledger group (with the exception of a small portion charged to General Burden). Office, Store Room, etc., will form a part of the General Burden; both this and Selling Burden being operating expenses belong to the Operating Ledger Accounts.

Accordingly we must open accounts for Non-Productive Labor, Wages and Salaries in both the Production and the Operating Ledgers, and we have now:

Production Ledger—

Account No. 25 Productive Labor
Account No. 26 Non-Productive Labor
Account No. 27 Wages
Account No. 28 Salaries

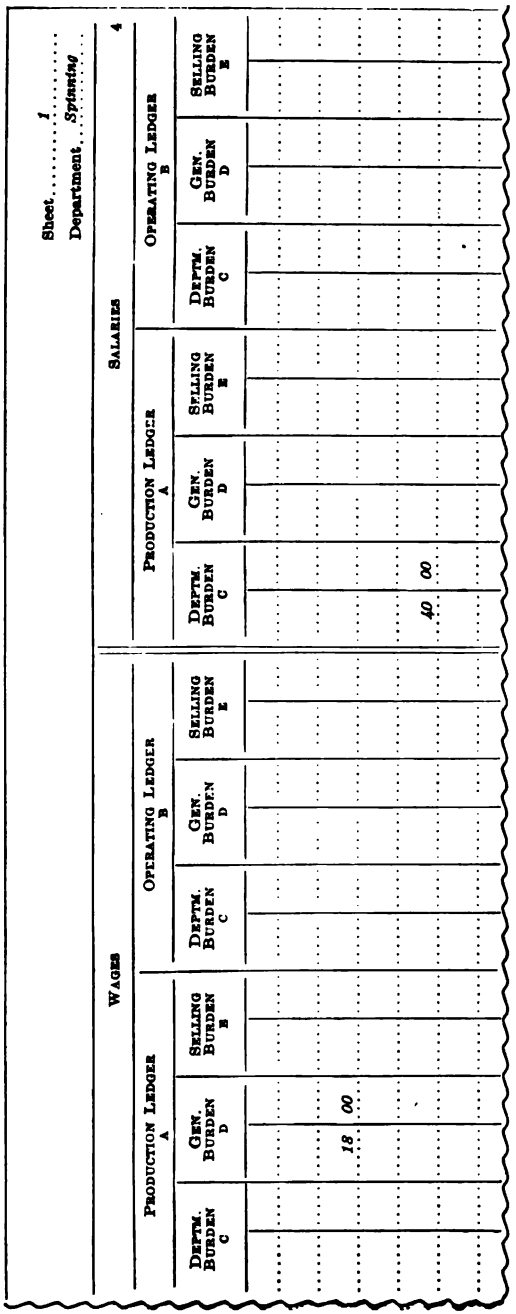
Operating Ledger—

Account No. 121 Non-Productive Labor

Payroll: Year *1920* Month *August* Week Ending *27*

No.	Distribution Symbol	Occupation Symbol	Name		Hrs.	Amount				Productive Labor 1		Non-Productive Labor 2					
						Regular	Overtime	Bonus	Total			Production Ledger A			Operating Ledger B		
												Deptm. Burden C	Gen. Burden D	Selling Burden E	Deptm. Burden C	Gen. Burden D	Selling Burden E
355	*1–*	*sp*	*Andrew*	*Lillian*	*44*	*17 50*		*1 55*	*19 05*	*19 05*							
356	*2–a–c*	*cl*	*Cook*	*Wm.*	*40*	*12 30*			*12 30*			*12 30*					
357	*3–a–d*	*fr*	*Flynn*	*Mich.*	*44*	*18 00*			*18 00*								
358	*2–b–d*	*sw*	*Capudo*	*Tony*	*50*	*18 00*	*3 15*		*21 15*							*21 15*	
359	*4–a–c*	*o*	*Smith*	*Geo.*	*44*	*40 00*			*40 00*								

Form 26. Payroll Sheet



Form 26. Payroll Sheet—(Continued)

Account No. 122 Wages
Account No. 123 Salaries

A form of payroll designed to afford the direct analysis is illustrated as Form 26.

For the charge distribution we shall proceed similarly as for the various supplies, constructing a "Payroll Distribution Sheet" (Form 27) with the charge accounts identical but with the addition of one more account—Goods in Process, Account No. 110.

The illustrated Payroll Distribution Sheet makes the direct posting of all accounts possible. Each account is represented in its right group; charges and credits separated and, after the distribution has been closed, the credits balance the charges in their respective groups. In the illustration, the first week is but two days and the last week is a full week. This is not always the case. Oftener the first week and the last week are both short weeks. The entries are made weekly or bi-weekly, or at every pay period, and the work is nothing more than copying the various totals of the payroll which will be arranged departmentally with subdivisions for the various kind of labor. The payroll must show in detail what operations or occupations are included; the warping room for instance will be divided into—

Spoolers
Warpers
Beamers
Doffers
Slashers
Drawing in
Twisting in in the direct labor group
Floor boys
Harness Hands in the indirect labor group

Similarly, the labor in all departments must be grouped on the payroll.

For wages and salaries a separate payroll book should be kept which includes all salaried employes. Being of a more confidential nature, it should not be handled with the other payroll. The construction will be the same.

After all posting of the accounts has been attended to, the distribution sheet must go to the manager who will find it to contain all information of interest to him.

Other Accounts of the Production and Operating Ledgers

Turning back to the burden chapter for a moment, we will find some cost factors yet to be considered. One of them is Depreciation on Machinery and Equipment. Since this includes fixtures of office, stock room, welfare equipment, etc., two accounts will be necessary, one including the productive departments, belonging, therefore, to the productive group and forming a part of the departmental burden. In a spinning and weaving plant this will be carding, spinning, warping, weaving, finishing, etc.; while in a knitting plant, winding, knitting, cutting, assembling, etc. We shall designate it by letters and so we shall open—

PRODUCTION ACCOUNT

Depreciation on Machinery and Equipment
- Account No. 105a Department M
- Account No. 105b Department N
- Account No. 105c Department O
- Account No. 105d Department P
- Account No. 105e Department R
- Account No. 105f Power, Light and Heat
- Account No. 105g Maintenance (Machine Shop)

also for the buildings a separate account as
- Account No. 106 Building Depreciation

For the rest of the equipment which will be charged in general burden, belonging to the operating group, we shall open—

Payroll Distribution for the Month of *January*, 19*20*

Pay Period			Credit Accounts—Production Ledger								Credit Accounts—Operating Ledger					
			Productive Labor Account No. 25		Non-Productive Labor Account No. 26		Wages Account No. 27		Salaries Account No. 28		Non-Productive Labor Account No. 121		Wages Account No. 122		Salaries Account No. 123	
1918	*January*	*1—2*	*1178*	*45*												
"	"	"			*204*	*10*					*13*	*15*				
"	"	"					*58*	*00*					*76*	*10*		
"	"	"													*120*	*30*
"	*January*	*4—9*	*3616*	*55*												
"	"	"			*560*	*90*					*67*	*30*				
"	"	"					*154*	*50*					*188*	*70*		
"	"	"													*302*	*25*
"	*January*	*11—16*	*3670*	*45*												
"	"	"			*549*	*50*					*64*	*15*				
"	"	"					*154*	*50*					*188*	*60*		
"	"	"													*302*	*25*
"	*January*	*18—23*	*3674*	*00*												
"	"	"			*555*	*10*					*64*	*80*				
"	"	"					*154*	*50*					*184*	*85*		
"	"	"													*302*	*25*
"	*January*	*25—31*	*3641*	*70*												
"	"	"			*552*	*75*					*64*	*80*				
"	"	"					*154*	*50*					*188*	*70*		
"	"	"													*1927*	*40*
Totals for Month			*15775*	*15*	*2422*	*35*	*676*	*00*			*274*	*20*	*820*	*95*	*2954*	*45*

Form 27. Payroll Distribution Sheet

| Goods in Process Account 110 | | |

OPERATING ACCOUNT

Depreciation on Fixtures and Furniture

Account No. 140a Store Room
Account No. 140b Stock Room
Account No. 140c Shipping Room
Account No. 140d Office
Account No. 140e Welfare
Account No. 140f General Burden

While in this group all will be ultimately absorbed by the General Burden, nevertheless there are some fixtures that must be charged directly as a general burden depreciation, hence it should have a depreciation account.

It should be remembered now that all depreciation charged to production and cost will form a reserve for replacement and new equipment and this must be accounted for among the assets. Accordingly we open—

LIABILITY ACCOUNT

Account No. 246 Reserve for Depreciation

This account is to be credited with the amounts charged to monthly cost, and debited with the replacements and purchases of new equipment. This account should be subdivided into departmental units, and the mill will have a dependable record showing how much reserve is available for each department for new purchases. The percentage index which is determined for the current year and how much burden for each month should be charged to each department is marked down on this account at the top of each subdivision. The development of such an index table has been fully explained in the Burden chapter.

The Account of Workmen's Compensation

This cost element is charged in proportion to the number of employes at a *varying rate,* so that each department has a

fixed charge. Accordingly we open in the *Production Ledger*

Workmen's Compensation, Account No. 107, to which all credits are entered that have been charged to the month's Departmental Burdens.

and in the *Operating Ledger*

Workmen's Compensation, Account No. 141, the same as above but for the group which is distributed under General Burden.

The distribution of the monthly shares of the various departments is usually determined when a policy is paid.

Insurance is paid in advance, and the amount not yet charged to cost forms an asset, so among Assets an account will be opened as

Insurance, Account No. 226, which will be debited with the amount of insurance at the time of the payment, and credited monthly with the amount charged to the month's cost.

Fire Insurance is charged to Rental in monthly units, and the amount paid in advance is treated similarly to workmen compensation insurance, being entered in an Asset Account No. 226, and called

Account No. 226a Fire Insurance

In every mill there are some expenditures connected with departmental burden, which may be so infrequent or irregular that keeping separate accounts would be unnecessary. However, some provisions must be made for these expenditures, so an account will be opened in the *Production Ledger* as

Departmental Sundry Expenses
Account No. 85a Department M
Account No. 85b Department N
Account No. 85c Department O
Account No. 85d Department P

Account No. 85e Department R
Account No. 85f Department S

This concludes the accounts connected with the Production Ledger and we can proceed to complete the Operating Ledger accounts. Since these represent the General Burden and the Selling Burden charges, we shall create accounts for the rest of our expenses and cost factors.

The management of the office will incur many small expenses for which an account will be opened in the Operating Ledger.

Sundry Office Expense

Account No. 145a Postage
Account No. 145b Telephone
Account No. 145c Telegraph
Account No. 145d Sundry Expenses

The damages to goods incurred during production form a part of the monthly general burden and an account will be opened—

Operating Ledger, Account No. 146, Seconds, to which the original cost of seconds is charged, the proceeds of sales credited monthly, and if the account for the month shows a loss, this is charged to general burden.

If the management decided to charge interest on Capital to cost, an account must be provided in the Operating Ledger as

Account No. 147, Interest on Capital Investment

The method of handling this cost item has been explained in the burden chapter. However, since all interest charged forms an accumulation toward dividends we must accordingly open a Liability Account as

Interest on Capital Investment No. 147, which is credited monthly with the amount charged to general burden.

Taxes

Taxes are paid at various periods of the year and their monthly allotment might easily involve complications. To simplify matters, the taxes paid the previous year should form the basis of distribution by dividing the total taxes into the number of months. Accordingly an account is opened—

Operating Ledger, Account No. 148, Taxes, credited with the last year's total and charged with the monthly amount distributed in general burden.

However, another account as Liability Account must be opened to carry the accruals which have not yet been paid for the current year but are nevertheless due; this account will be, therefore—

LIABILITY ACCOUNT

Accrued Taxes, Account No. 208, charged with such accruals and credited with payments rendered thereon.

Further there will be expenses, like pensions, legal expense and other general burden factors for which an account must be created, as

OPERATING LEDGER

Sundry General Expenses, Account No. 149, This may be subdivided into sections to suit individual requirements. The monthly charges must be divided carefully so that each month carries an even burden.

Interest on Borrowed Capital

Capital is borrowed not only to meet current running liabilities but also to render payments on purchases and take advantage of discounts. Consequently the discount deductions on purchases should help toward the payments of interest on borrowed capital, and we open an account—

OPERATING LEDGER

Interest, Account No. 150, charged monthly with the accrued interest on borrowed capital and credited with the discount deductions on purchases. The difference is charged to the monthly General Burden if the interest on borrowed capital is greater than the credits for discount deductions; if the deductions are greater, this difference will form a part of the monthly profit of the business.

Such accrued interest on borrowed capital forms a liability and we must open

LIABILITY ACCOUNT

Accrued Interest No. 209, charged with such accruals and credited with payments thereon.

This is the end of the group absorbed finally by the General Burden Account, to which the number 151 is already given. The remaining factors belong to the selling transactions and will form either a part of the selling burden or of direct selling factors.

Under Selling Burden we shall have additional accounts for Allowances for which each month must carry its proportionate share, accordingly we open

OPERATING LEDGER

Account No. 160, Allowances on Sales, charged with such deductions; credited with the monthly average charged to selling burden.

Account No. 161, Traveling and Entertaining, charged with incurred expenses; credited with monthly average, charged to selling burden.

Account No. 162, Advertising, charged with incurred expenses, credited with monthly average, charged to selling burden.

Account No. 163, Rent and Maintenance of Sales Office, charged with incurred expenses, credited with monthly average, charged to selling burden.

Account No. 164, Cost of Samples, charged with cost of samples, credited with proceeds of sales of samples. The monthly average of the difference is charged to selling burden.

Account No. 165, Collections and Exchange, charged with monthly cost of such expense, credited with the identical charge made to selling burden.

Finally we have some purely Functional Accounts, similar to the Goods in Process Account already discussed in the production group. Such accounts serve as mere carriers for the accumulated costs for the monthly balance sheet.

To "Goods in Procees Account No. 110" all raw material, labor and departmental burden are charged, representing the monthly departmental cost of all production. At the end of the month from the cost control records these accounts will be credited with the total value of finished product at the departmental costs. The difference must, therefore, represent the goods in process at the close of the month, and the aggregate amount of all productive departments will therefore be the inventory value of goods in process.

The semi-finished reserve, like yarn in a weaving plant or fabric in a knitting plant, is charged to the stock records of semi-finished goods, and as explained in the burden chapter will carry no general burden, but their total value, which is shown on the stock records, will form on the balance sheet the Inventory of semi-manufactured stock.

The value of the finished product at the end of the month from the cost and control records is totaled and charged to the

OPERATING LEDGER

Account No. 170, Finished Goods in Stock, charged with total manufacturing cost, also with total general burden and total selling burden.

To this account the *cost value* of shipments is credited and the account now represents the Inventory Value of Finished Goods in Stock.

Of course, during the construction of the cost control records, care will be taken to so construct them that all information is extended currently and the work at the end of the month consists of nothing more than an addition of totals.

We must open now in the Operating Ledger

Account No. 175, Gross Sales, charged with the credits of Account 170, total shipments of the month, also the month's cost of Freight and Express on Sales, Commission on Sales and Discount on Sales.

We must open now in the Operating Ledger

Account No. 172, Freight and Express on Sales, charged with payments of the month, credited with total, charged to monthly Gross Sales.

Also, Operating Ledger

Account No. 173, Commissions on Sales, charged with commissions due for the month's sales and credited at the end of the month by charging the total to Gross Sales Account No. 175.

This also means an accrued liability and we open, therefore, an account in the General Ledger,

Liability Account No. 243, Commission, to be charged with such accrued liability and credited with payments thereon.

Finally we have

Account No. 174, Discounts on Sales, to be charged with the discount on the sales of the month and credited with same amount, which is charged into Gross Sales Account No. 175.

We have reached the last lap of the construction of the control accounts. The total sales (meaning goods actually shipped) of the month are credited to Gross Sales, and the difference of the total credits over total charges *represents the actual profit made during the month.* It should be borne in mind that profits are computable only on shipped goods and not on manufactured goods.

We open now the rest of the General Ledger Accounts, which will be—

Assets

Cash in Banks

Account No. 220 charges and credits to which are made through the cash journal.

Petty Cash Fund

Account No. 221 charged through petty cash slips, credited through cash entries.

Notes Receivable

Account No. 222 charged through journal entries, credited in the same manner.

Accounts Receivable

Account No. 223 charged through sales journal, credited by journal entries for notes and cash journal for cash.

Personal Accounts

Account No. 224 charged and credited through journal or cash journal entries.

Production Ledger

Account No. 225 charged through voucher register, credited through records of monthly stock and supply withdrawals.

Investments

Account No. 227 charged and credited through cash journal.

Plant and Equipment

Account No. 228 charged for start from inventory records, for purchases from voucher register; credited for depreciation from account 105 also cash journal, for sales on machinery.

Furniture and Fixtures

Account No. 229 charged for start from inventory records, for purchases from voucher register. Credited for depreciation from account 140, also cash journal for sales on machinery.

Good Will

Account No. 230 a purely personal account, journalized at the time of consideration as capital. Credited the same way at the time of termination.

Sundries

Account No. 231 a reserve account for unforeseen assets or miscellaneous factors, such as value of life insurance policy, etc.

The following additional Liability Accounts must be created, besides those already constructed:

Liabilities

Notes Payable

Account No. 240 charged from cash journal, credited the same way.

Accounts Payable
Account No. 241 charged and credited from voucher register.

Reserve for Doubtful Accounts
Account No. 244 charged and credited from journal entry.

Income Tax Deductions
Account No. 250 charged and credited from journal entry

Capital Stock
Account No. 251 charged and credited from journal entry

Income from Operations Current Year
Account No. 252 charged and credited from journal entry

This completes the accounts essential for a modern cost control organization. The next consecutive step is the construction of a table of accounts. Such a table will be the guiding chart for the chief accountant. The procedure is the listing of all accounts in numerical order, marking the sources of charges, also of the credits and the absorbing accounts. All this information will also be marked on the respective ledger sheets.

The prepared Table of Accounts should be carefully examined. It will be seen that in a modern cost control system nothing is left to chance or loose judgment. The relation of one account to another is carefully determined and there is not a single unnecessary entry, and when all accounts are closed each and every one yields automatically its part of the cost.

There are accounts of special interests:

Departmental Burden Accounts 80, 81, 82, 83, 84
General Burden Account 181

Selling Burden Account 171
Productive Labor Account 25

These accounts supply monthly the much coveted burden basis for costing the articles. How will this work?

Let us presume that the mill is a spinning and weaving plant, and from the accounts at the end of the month the following information is secured:

	Total Productive Labor for Month	Total Burden for Month	Based on Productive Labor % of Department Burden
Carding Department ..	$911.15	$510.19	56%
Spinning Department ..	1,105.60	715.30	65%
Warping Department .	1,213.00	419.11	51%
Weaving Department .	1,931.45	778.49	40%
Finishing Department .	662.20	217.55	33%
Total Departmental ...	$5,823.40	$2,640.64	45%
General Burden	5,823.40	3,149.60	54%
Selling Burden	5,823.40	723.10	12½%

This percentage information is given to the cost department. All burden is computed now *in relation to the direct labor* expended on an article.

How will the above information serve for future estimates?

Supposing a sample is submitted for an article for prompt delivery, and according to the analysis we have—

Cost of Raw Materials	$179.55
Productive Labor Cost	23.40

We now use the above percentages on the productive or direct labor cost and will have—

Departmental Burden 45%	$10.50
General Burden 54%	12.75
Selling Burden 12½%	2.95
Boxing, Freight, Discount, Commission.....	6.53
Total Cost	$235.68

We may turn now to the accounts that will help the construction of a monthly balance statement.

In order to do so, we must know the value of raw materials and supplies in stock. No inventory is necessary. In the Voucher Register, the "Stock Ledger" section will automatically give at the end of the month the total value of purchases for the month. The raw materials and supplies withdrawn from stock during the month we also registered and, therefore, all material and supply accounts represent the value of stock on hand.

The value of goods on machines or the inventory of the goods in process is obtained from Account 110.

The semi-finished stock on hand is obtained through the stock records kept for this purpose.

The value of finished goods on hand is shown in the Account 170.

Thus every month an inventory is possible without going through the painful and expensive stock taking process.

The proper construction of the control accounts means the success or the failure of the cost control system. While inevitably it will mean additional clerical labor, modern business needs modern administrative machinery just as much as it needs modern machinery for efficient production.

As has been pointed out before, the accounts should reflect all activities of the business in a condensed form and the records are but carriers of information. All production records have but one ultimate purpose—to serve the accounts. There should be no deviation from the rule that *no factory records should be constructed unless the whole system has been developed.* The disregarding of this rule is the cause of so many mills having hundreds of records but no scientific system of control.

Nor is the mechanical upkeep of a cost control system a superhuman task. The preparation of a table of accounts and a chart of accounts will enable any individual with an average

TABLE OF ACCOUNTS—COST CONTROL

LEDGER	ACCOUNT	ACC'T NO.	CLASS	SOURCE OF MONTHLY CHARGE	SOURCE OF MONTHLY CREDIT	ABSORBING ACC'T	NUMBERS
Production	*Raw Material*	*1*	*Accumulating*	*Monthly Charge Sheet taken from Vouchers*	*Monthly Credit Sheet of Materials*	*Goods in Process*	*110a to e*
"	"	*2a to c*	"	"	"	"	"
"	"	*3a to h*	"	"	"	"	"
"	*Mfg. Supplies*	*11*	"	"	*Monthly Credit Sheet of Supplies*	*Departmental Burden*	*80, 81, 82, 83, 84*
"	*Machine Supplies*	*12a to e*	"	"	"	"	"
"	*Gen. Factory Supplies*	*13*	"	"	"	*Departmental Burden* *General Burden*	*80, 81, 82, 83, 84* *100, 101, 102, 130, 131, 132, 133, 134*
"	*Building Supplies*	*14*	"	"	"	*Rental*	*101*
"	*Shipping Supplies*	*15*	"	"	"	*Shipping*	*132*
"	*Power, Light Heat, Supplies*	*16*	"	"	"	*Power, Light, Heat*	*100*
"	*Machine Shop Supplies*	*17*	"	"	"	*Machine Shop*	*102*
"	*Stationery, Printing Supplies*	*18*	"	"	"	*Departmental Burden* *General Burden*	*80, 81, 82, 83, 84* *100, 102, 130, 131, 132, 133, 134*
"	*Waste*	*21a to f*	"	*Monthly Waste Report*	*Monthly Waste Report*	*Sales of Waste*	*22*
"	*Sales of Waste*	*22*	*Absorbing*	*Acc'ts 21a to f*	*Cash Journal for Sales of Waste*	*Goods in Process (to be credited)*	*110a to e*
"	*Productive Labor*	*25*	*Accumulating*	*Monthly Payroll Distribution Sheet*	*Monthly Payroll Distribution Sheet*	*Goods in Process* *Also Liability Acc't*	*110a to e* *245 for Accruals*
"	*Non-productive Labor*	*26*	"	*Monthly Payroll Distribution Sheet*	*Monthly Payroll Distribution Sheet*	*Departmental Burden* *Also Liability Acc't*	*80, 81, 82, 83, 84* *100, 101, 102, 103, 245 for Accruals*
"	*Wages*	*27*	"	"	"	"	"
"	*Salaries*	*28*	"	"	"	"	"

Form 28. Table of Accounts

Ledger	Account	Acc't No.	Class	Source of Monthly Charge	Source of Monthly Credit	Absorbing Acc't	Numbers
Production	Carding Burden	80	Absorbing	Accounts 11, 12, 13, 18, 26, 27, 28, 100, 101, 102, 105, 107	Goods in Process 110a	Goods in Process	110a
"	Spinning Burden	81	"	"	Goods in Process 110b	"	110b
"	Warping Burden	82	"	"	Goods in Process 110c	"	110c
"	Weaving Burden	83	"	"	Goods in Process 110d	"	110d
"	Finishing Burden	84	"	"	Goods in Process 110e	"	110e
"	Sundry Dep't Expense	85a to d	Accumulating	Monthly Charge Sheet taken from Vouchers	Departmental 80, 81, 82, 83, 84	Dep't Burden	80, 81, 82, 83, 84
"	Power, Light, Heat	100	"	Accounts 13, 18, 26, 27, 28, 101, 102, 105, 107	Dep't Burden 80, 81, 82, 83, 84 Also Acc'ts 102, 130, 131, 132, 133, 134, 151	Dep't Burden Acc'ts Admin. Burden Acc'ts General Burden	80, 81, 82, 83, 84 102, 130, 131, 132, 133, 134 151
"	Rental	101	"	Accounts 13, 14, 26, 27, 28, 102, 106, 107, 108	Dep't Burden 80, 81, 82, 83, 84 Also Acc'ts 100, 102, 130, 131, 132, 133, 134, 151	Dep't Burden Acc'ts Admin. Burden Acc'ts General Burden	80, 81, 82, 83, 84 100, 102, 130, 131, 132, 133, 134 151
"	Maintenance	102	"	Accounts 13, 18, 26, 27, 28, 100, 101, 102, 105, 107	Dep't Burden 80, 81, 82, 83, 84 Also Acc'ts 100, 101, 102, 130, 131, 132, 133, 134, 151	Dep't Burden Acc'ts Admin. Burden Acc'ts General Burden	80, 81, 82, 83, 84 100, 101, 102, 130, 131, 132, 133, 134 151
"	Depreciation of Mach. Equipment	105	"	Index Table of Departmental Charges	Dep't Burden 80, 81, 82, 83, 84, Also Acc'ts 100, 102	Dep't Burden Acc'ts Also Acc'ts Also Liability Acc't Also Asset Acc't	80, 81, 82, 83, 84 100, 102 246 to be Charged to Total 228 to be Credited to Total
"	Depreciation of Building	106	"	Monthly Share of Depreciation	Rental 101	Rental Also Liability Acc't Also Asset Acc't	101 246 to be Charged to Total 228 to be Credited to Total
"	Workmen Compensation Insurance	107	"	Index Table of Monthly Dep't Charges	Dep't Burden 80, 81, 82, 83, 84 Also Acc'ts 100, 101, 102	Dep't Burden Acc'ts Also Burden Acc'ts Also Asset Acc't	80, 81, 82, 83, 84 100, 101, 102 216 Charge to Payment, Credit to Burden Charges
"	Fire Insurance	108	"	Monthly Share of Total	Rental 101	Rental Also Asset Acc't	101 216a Charge to Payment, Credit to Burden Charges

Form 28. Table of Accounts—(Continued)

Ledger	Account	Acc't No.	Class	Source of Monthly Charge	Source of Monthly Credit	Absorbing Acc't	Numbers
Production	*Goods in Process*	*110*	*Absorbing*	*Accounts 1, 2, 3, 25, 80, 81, 82, 83, 84*	*Acc't 22 Deduction for Waste Value. Total from Acc't 170 Finished Goods in Stock*	*Finished Goods in Stock* *Also Stock Records of Semi-finished*	*170* *Stock and Stock in Process*
Operating	*Mon. Productive Labor*	*121*	*Accumulating*	*Monthly Payroll Distribution Sheet*	*Monthly Payroll Distribution Sheet*	*Adm. Burden Acc't* *General Burden* *Also Liability Acc't*	*130, 131, 132* *151* *245 for Accruals*
"	*Wages*	*122*	"	"	"	*Adm. Burden Acc'ts* *General Burden* *Also Liability Acc't*	*130, 131, 132, 133, 134* *151* *245 for Accruals*
"	*Salaries*	*123*	"	"	"	*Adm. Burden Acc'ts* *General Burden Acc't* *Selling Burden Acc't* *Also Liability Acc't*	*130, 131, 132, 133, 134* *151* *171* *245 for Accruals*
"	*Store Room*	*130*	"	*Accounts 13, 18, 100, 101, 102, 121, 122, 123, 140a, 141*	*General Burden 151*	*General Burden*	*151*
"	*Stock Room*	*131*	"	*Accounts 13, 18, 100, 101, 102, 121, 122, 123, 140b, 141*	"	"	"
"	*Shipping Room*	*132*	"	*Accounts 13, 15, 18, 100, 101, 102, 121, 122, 123, 140c, 141*	"	"	"
"	*Office*	*133*	"	*Accounts 13, 18, 100, 101, 102, 122, 123, 140d, 141, 146*	*General Burden 151* *Selling Burden 171*	*General Burden* *Selling Burden*	*151 (in proportion of use)* *171* "
"	*Welfare*	*134*	"	*Accounts 13, 18, 100, 101, 102, 121, 122, 140e, 141*	*General Burden 151*	*General Burden*	*151*
"	*Depreciation of Fixtures and Furniture*	*140a to f*	"	*Index Table of Departmental Charges*	*Adm. Burdens 130, 131, 132, 133, 134* *General Burden 151*	*Adm. Burden Acc'ts* *General Burden Acct's* *Also Liability Acc't* *Also Asset Acc't*	*130, 131, 132, 133, 134* *151* *246 to be charged to Total* *239 to be Credited to Total*
"	*Workmen Compensation Insurance*	*141*	"	"	*Adm. Burdens 130, 131, 132, 133, 134* *General Burden 151* *Selling Burden 171*	*Adm. Burden Acc'ts* *General Burden* *Selling Burden* *Also Asset Acc't*	*130, 131, 132, 133, 134* *151* *171* *216 Charge to Payments, Credit to Burden Charges*

Form 28. Table of Accounts—(Continued)

Ledger	Account	Acc't No.	Class	Source of Monthly Charge	Source of Monthly Credit	Absorbing Acc't	Numbers
Operating	Office Sundry Expenses	145a to d	Accumulating	Monthly Charge Sheet taken from Vouchers	Office 133	Office	133
"	Seconds	146	"	Monthly Report	Sales of Seconds	Excess of Cost Over Sales by General Burden	151
"	Interest on Capital Investment	147	"	General Burden 151	Monthly Share at Last Year's Total	General Burden Also Liability Acc't	151 247 charge same amount
"	Taxes	148	"	"	"	General Burden Also Liability Acc't	151 248 for Accruals
"	Sundry General Expenses	149	"	Monthly Charge Sheet taken from Vouchers	Average Monthly Share of Total, General Burden 151	General Burden	151
"	Interest on Borrowed Capital	150	"	Monthly Charge Sheet taken from Vouchers or Journal Entry	Voucher Register Discount on Purchases	Excess of Interest over Discount by General Burden Also Liability Acc't	151 249 of charges to payments
"	General Burden	151	Absorbing	Accounts 13, 100, 101, 102, 121, 122, 123, 130, 131, 132, 133, 134, 140, 141, 146, 147, 148, 149, 150	Finished Goods in Stock 170	Finished Goods in Stock	170
"	Allowances on Sales	160	Accumulating	Journal Entry	Selling Burden 171	Selling Burden	171
"	Travelling Expenses	161	"	Monthly Charge Sheet taken from Vouchers	"	"	"
"	Advertising	162	"	"	"	"	"
	Rent, Maintenance of Sales Office	163	"	"	"	"	"
"	Cost of Samples	164	"	Monthly Charge Sheet taken from Vouchers, also Cost Reports	Sales of Samples	Excess of Cost over Sales to Selling Burden	"
"	Collection, Exchange	165	"	Journal Entry	Selling Burden 171	Selling Burden	"
"	Finished Goods in Stock	170	Absorbing	Goods in Process 110 General Burden 151 Selling Burden 171	Gross Sales 175	Gross Sales	175

Form 28. Table of Accounts—(Continued)

Ledger	Account	Acc't No.	Class	Source of Monthly Charge	Source of Monthly Credit	Absorbing Acc't	Numbers
Operating	Selling Burden	171	Absorbing	Accounts 153, 160, 161, 162, 163, 164, 165, 123	Finished Goods in Stock 170	Finished Goods in Stock	170
"	Freight, Express on Sales	172	Accumulating	Monthly Charge Sheet taken from Vouchers	Gross Sales 175	Gross Sales	175
"	Commissions on Sales	173	"	Journal Entry	"	Also Liability Acc't	243 for Accruals
"	Discount on Sales	174	"	Monthly Charge Based on Total of Sales Journal	"	Gross Sales	175
"	Gross Sales	175	Absorbing	Acc't 170 for Shipped Goods at Cost Value, also Acc'ts 172, 173, 174	Total of Month's Sales	Income Current Operations	253 the difference of credit over charges, Profit
General	Cash in Banks	220	Assets	Cash Journal	Cash Journal		
"	Petty Cash Fund	221	"	Petty Cash Journal	Petty Cash Journal		
"	Notes Receivable	222	"	Sales Journal Cash Journal	Cash Journal		
"	Accounts Receivable	223	"	Sales Journal	Cash Journal		
"	Personal Accounts	224	"	Cash Journal	Cash Journal		
"	Production Ledger, Stock on Hand	225	"	Raw Materials, Supplies; Voucher Register: Finished Goods in Stock Acc't 170	Gross Sales 175		
"	Insurance	226	"	Voucher Register	Accounts 107, 141		
"	Fire Insurance	226a	"	"	Account 108		
"	Investments	227	"	"	Cash Journal		
"	Plant Equipment	228	"	Inventory Records for Start, Voucher Register for Purchases	Cash Journal for Sales Accounts 105, 106 for Depreciation		
"	Furniture, Fixtures	229	"	"	Cash Journal for Sales Account 140 for Depreciation		
"	Good Will	230	"	Journal	Journal		
"	Sundries	231	"	Cash Journal	Cash Journal		

Form 28. Table of Accounts—(Continued)

Ledger	Account	Acc't No.	Class	Source of Monthly Charge	Source of Monthly Credit	Absorbing Acc't	Numbers
General	Notes Payable	240	Liability	Journal or Cash Journal	Journal or Voucher Register		
"	Accounts Payable	241	"	Creditor's Ledger	Voucher Register		
"	Commissions	243	"	"	"		
"	Reserve for Doubtful Accounts	244	"	Journal	Journal		
"	Payroll Accrual	245	"	Accruals	Cash Journal		
"	Reserve for Depreciation	246	"	Voucher Register for Purchases and Renewals	Accounts 105, 106 and 140		
"	Interest on Capital Investment (Dividends Payable)	247	"	Account 147	Voucher Register		
"	Taxes Accrued	248	"	Accruals	"		
"	Interest on Loans	249	"	Journal	"		
"	Income Tax Deductions	250	"	"	"		
"	Capital Stock	251	"	"	Journal		
"	Surplus	252	"	"	"		
"	Income Current Operations	253	"	"	"		

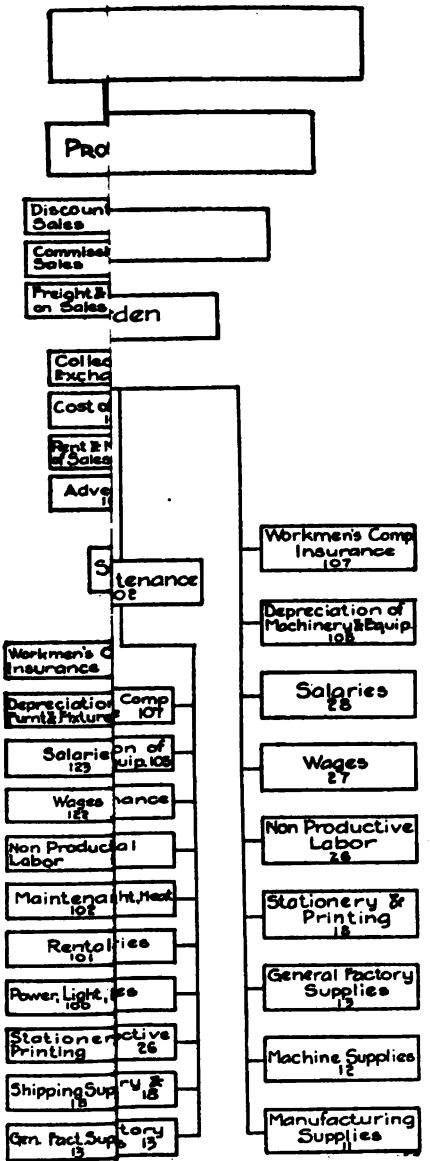
Form 28. Table of Accounts—(Concluded)

REMARKS: The Departmental Divisions, 80, 81, 82, 83, 84 depend on the branch of the industry. The above schedule represents the extreme requirements of account construction. The consolidation of accounts is possible and this should be done with judgment to obtain a control as simple as possible without sacrificing important features of the control.

knowledge of bookkeeping to keep up the system. A Table of Accounts should be prepared in such a manner that all information regarding charges and credits are easily obtained by any individual no matter how unfamiliar he may be with that particular set of books. Such Table of Accounts is illustrated (Form 28) and should be prepared upon the completion of the control accounts. A change of personnel in the accounting department of a mill will be robbed of the irksome task of breaking in the new employe; since all information referring to the Accounting System is available in an authorized concrete form.

Finally the preparation of a chart of the cost control accounting system as illustrated in Form 29 will show in a simple graphic manner the relation of one account to another together with the groupings, showing step by step the scientific construction of the cost of an article.

With the control accounts completed, there will be no guess work about the number of records needed and their form of construction. The accounts determine this. We have the accounts constructed and now we can proceed with the record construction which is a definite task.


Discount Sales
Commissi Sales
Freight & on Sales
Collec Excha
Cost o
Rent & M of Sales
Adve
Workmen's Comp Insurance 107
Depreciation of Machinery & Equip 108
Salaries 28
Wages 27
Non Productive Labor 26
Stationery & Printing 18
General Factory Supplies 13
Machine Supplies 12
Manufacturing Supplies 11
Workmen's C Insurance
Depreciatio Furn. & Fixtur
Salarie 123
Wages 122
Non Produc Labor
Maintena 102
Rental 101
Power, Light, 106
Stationer Printing
Shipping Sup 19
Gen. Fact. Sup 13

CHAPTER X

THE RECORDS OF CONTROL IN GENERAL

There are certain truths and facts so simple that only elaborate demonstrations will make the point clear and conclusive. Such a one is the often repeated, but almost constantly disregarded warning that control and cost records are not capable of imitation, as their usefulness will depend entirely on their originality and resourcefulness to serve the ultimate purpose.

Cost records are the instruments, the tools of the cost control system, the conveyors of the information to the final records or accounts. The proverb that "the tail cannot wag the dog" has a full meaning here. Each record will have to serve a definite and ultimate purpose, which is determinable only *after this ultimate purpose has been fully developed.* The accounts and their relation to each other is the purpose, and there is no excuse for any record unless it fully contributes to this ultimate aim. A factory record is either indispensable or utterly needless; there is no half-way measure.

A record cannot be copied, it must be developed. The numberless illustrations in this book are, therefore, not intended for unconditional reproduction, but as examples of how a specific case of similar character has been handled and on what general lines a homogeneous problem may be solved.

A cost control system has an ultimate purpose, and any temporary method will lead nowhere. Any attempt to depart from the routine outlined above will lead to confusion and

is purposeless. Here is an example: It may be instructive to review the conditions found in a woolen mill by the writer when he undertook the commission of installing a proper cost control system.

The copies of purchases of stock were kept on a nail in the superintendent's office, but were never referred to, as the superintendent kept in his memory all purchases of the season. The sheets became dusty and yellow with age, and when the nail would hold no more the oldest ones were destroyed. (This was the reference record.)

When a lot was delivered the boss sorter came down for the invoice to check the shipment and make out a stock sheet, which was a copy of the bill and was kept in a loose leaf binder on his desk. He approved the bill, which was passed to the superintendent, and the latter had a little memorandum book in which he entered the source of the lot, number of bales and total pounds. When the boss sorter made a test he entered the actual shrinkage. This test record was a greasy slip of paper. The bookkeeper made his regular purchase entry and also kept a general account for wool purchases, which was used for the bi-yearly profit and loss balance statement. He also kept a merchandise freight account, in which all freights on merchandise, including supplies, etc., were lumped. There was no way of determining which charges referred to wool shipments.

Unreliable Stock Records

The above mentioned stock sheet, kept by the boss sorter, prior to the investigation was considered the mill's reliable record of stock on hand, since every time a bale was given to a sorter it was supposed that the bale number was crossed out and the date of taking out of stock noted. Wool sorting is a greasy business, and the condition of these "stock records" after six months' fingering by wool sorters may easily be

imagined. During the change from the old system to the new, a physical inventory was taken of the wool stock, which revealed that bales supposed to have been used up months ago were still in stock, and others, available in the stock record, could not be found. Many of these discrepancies were caused through checking wrong bale numbers or wrong lot numbers, a natural outcome of the methods in vogue at the time. The wool sorters were told by the boss sorter, after consulting his stock record, what lot and bale number they should take. Wool sorting was piece work, and if the numbers given to the sorter were not right under his hand, he would take any number to save time.

But there was another reason for such unreliable stock records. In spite of the fact that the mill carried as many as five hundred bales in stock, and a proportionate amount of sorted wool, the management had no floor man, meaning to keep expenses down by letting everybody help himself. The stock room was a chaos of disorder. Bales belonging to one lot were found in two or more places, mixed up with other lots. It was the teamsters' duty to bring the bales right into the stock room, and being in a hurry he dumped them anywhere. Add to this the practice of the wool sorters in taking their own bales, and it will require very little reasoning to recognize why the actual stock was $9,000 more than indicated in the stock record. What a loss in case of fire! They did not take the precaution to keep even this unreliable stock record in the safe overnight, but left it in a drawer of the boss sorter's desk.

Little Attention to Shrinkage

As to the sorted stock, no records whatever were kept. When the sorting was low they sorted more wool, the testing of the first two bales serving as a basis for cost calculations. Every morning the boss sorter sent a slip to the superintendent showing the previous day's sorting, which at the end of the

week was summarized to be used as production and cost data for the department.

The control of scouring and scoured stock was a simple proposition. The bins were designed for one thousand pounds' capacity. The scouring boss had instructions to keep the bins full, so every morning he made his rounds and filled up the bins with the various sortings. Some sortings he scoured every day, others but once a week or month. The feeder man was given instructions to bring down so much sortings and scourings. The boss entered the total number of pounds ordered from the feeder man into his scouring memorandum. The feeder man was supposed to weigh the sortings before bringing them down, but when questioned he admitted that this was done only when the superintendent or the boss happened to be around. At other times he estimated that the crates held about 350 pounds, and let it go at that. What a simple account for a mill working both low and high shrinking wools! The scourer tried to save extra work, but he was cunning enough to tell the boss that the load was 490 to 510 pounds in order to give the impression that he was a conscientious worker. Occasionally he brought down a wrong sorting, causing an off-batch and making warps so tender that they had to be cut out; while the carder accused the spinner, and the spinner accused the carder, and finally both accused the dyer, who in turn said a few uncomplimentary things about the dresser.

This scourer was not an exception. Like the average mill worker, he needed control; otherwise he followed the line of least resistance. If he possessed reliability and initiative, he would have pushed to a better position. Such conditions are likely to be an everyday occurrence in any department unless there is proper control. Personal and individual supervision is not enough.

The wool was dyed after being scoured and the dyed stock

was also in charge of the scouring boss. The dyer was of the old school, still living in the illusion that dyeing is a secret art and refusing to give any information regarding the materials and chemicals used, merely going to the superintendent's office every morning and reporting verbally what he had dyed the previous day.

Records, but Not System

In spite of the fact that the mill had no system whatever, there were plenty of records. But while there were ten records of the stock in process in these three departments, the management did not have as a result any more than loose information of production and direct labor costs. They had no dependable stock record, the most important tool in the hands of the superintendent and the principal index for buying material. The mill had taken government orders occasionally, also special orders requiring special blends, and the stock room was littered with odds and ends, some of which were five years old. They had no record as to the actual needs of the season to cover orders, but estimated this roughly, and as a result were overstocked in some wools and short in others.

The detailed production of the sorting, as well as of the scouring and dyeing, was in a lump sum. At the end of the week the payroll of this department was divided by the production, and they called this the "average cost," a thing wrong from the very start. The superintendent had to depend entirely upon the department heads' ability and honesty, two virtues demanded in business, but nevertheless desirable to reinforce with the proper control system. If production went off, or something went wrong, there was always an excuse, but never a reason, nor had definite steps even been taken to remedy this condition. If the blower system in the scouring room got out of order, production fell off. The blower was repaired hurriedly, but the cause was not removed.

The dyehouse was constantly short of help and the picker waited again and again for shades. The dyer blamed the quality of the labor supply; the superintendent blamed the unhealthy business of dyeing, while the real cause was the boss dyer himself. The mill changed superintendents frequently, and each new man brought a new system snatched from another mill, and tried to force it into operation. The systems were changed, but not the methods. Some of them gave an inkling, but not data. The above is not overdrawn; there is nothing smoothed over, nothing added. It is a report of conditions as they were. Conditions such as this are by no means exceptions. The reasons are the utter disregard of the principles of cost accounting, the desire for quick remedies, no ultimate purpose, and consequently no results, but confusion.

The next problem is the technical knowledge of record construction. There are certain elementary rules of record construction that must be followed or the best conceived plan will fall short of success when it comes to the every day use of the form.

Manufacturers often copy forms unsuited for their purpose, with results that are unsatisfactory in every way. A brief outline of the principles of form or record construction will prove useful. The factors for consideration are:

1. Purpose.
2. How often used.
3. Type of help expected to use it.
4. Importance of record.

The size of the record and the divisions must be in accordance with the purpose. From the standpoint of economy, stock size paper should receive first consideration. Take, for example, the construction of the departmental requisition for supplies to the storekeeper. (Form 30.) No supplies should be taken without the foreman's authority, and proper

stock accounts must be kept so that the management can know to what extent the departments have drawn on stock, not only as data for stock replenishing, but also for cost and control. So this record must show the following:

Date.
Department.
Quantity.
Description of the article.
Signature of the person on whose authority the supplies are drawn.

SUPPLY STORES REQUISITION No.

Date.....

Kindly Deliver to Department.....

QUANTITY	ITEM
.....	.....

MAT. LEDG. ACCOUNT #	DATE ISSUED	DATE CHARGED	UNIT VALUE	TOTAL VALUE

Foreman.....

No materials will be distributed without the signature of foreman.

Please put only one item on a requisition.

Form 30. Requisition Form Correctly Constructed

This is all the information necessary as far as the mill is concerned, and this is as far as the average individual would go in the construction of a stores requisition. This illustration affords a striking example of the warning given above that no

control record should be constructed unless its ultimate purposes have been definitely established. This record should be constructed, not only with the view in mind that a responsible individual has to make out the requisition, but also that it should serve as an authoritative document for the credit entry of the proper material ledger account which naturally must be credited with the withdrawal, and at the same time as a record for the office to charge the material control accounts at the end of the month with the value of material and supply withdrawals. It should be also borne in mind that the clerical labor involved in registering the transaction is to be kept at minimum. The entries into the material ledger should be made only once a week, and this will necessitate that all requisitions be provided with the material ledger account numbers. This is possible by marking on the bin or the bin ticket of each article the corresponding material ledger number, and when goods are given out this number should be marked on the requisition. Without such provisions, in a large mill one clerk would be kept constantly busy with the material ledger, which work with the help of the above arrangement can be attended to in one or two days. This also explains why only one article should be requisitioned on one record, which arrangement, as proved in practice, works no particular hardship on anybody. The record must also be provided with information regarding date issued, date charged, unit value and total value; the last information being the basis for the monthly charge entry for the control ledger accounts, which is obtained by adding the total values on the requisitions issued during the month for materials and supplies, according to departments.

Therefore, the following additional information must be shown on the stores requisition to provide a concise record for all purposes:

Material Ledger Account Number
Date Issued

Date Charged
Unit Value
Total Value
And the Note—"Please put only one item on the requisition."

Since a requisition is made out every time a supply is drawn, space need be provided for only one item at a time. The requisition is made out and signed. A very cheap grade of paper will answer for the purpose.

The type of help expected to use it includes overseers, second hands, section hands, storekeepers and clerks—persons who have knowledge of the English language—so all printed matter and explanation on the record can be brief and concise. But as the requisitions are made out with pencil in a hurried manner, the space divisions must be big enough to write in without crowding.

Coming to the last of the factors enumerated above, importance of the record, the department putting in a requisition for materials wants some proof of the act after the record leaves the department, therefore these requisitions must be made in duplicate, and the copy retained by the respective departments. It is also important that no requisitions be lost before they are entered in the stock record. The requisitions and the duplicates are numbered, so the persons making the entry will detect a missing number, trace it, and if lost the entry can be made from the duplicate.

Next comes the spacing. Remembering that these records are made with pencil by persons who are generally not accustomed to much writing, the spaces must be generous for bulky letters and figures. Those who are not familiar with the proper spacing will do well to take specimens of the handwriting of the various employes who are expected to fill out these records, and determine the average letters per inch as a

basis of space division for all factory records. The writer made many experiments in this direction among mechanics and general mill help, and found that the most suitable division for factory purposes is on the basis of an allowance of one inch for five letters or figures, with spaces 5/16 inch high. For records filled out by office employes seven letters or figures per inch, with spaces ¼ inch high, is more suitable.

The record under discussion will be filled out by mechanics. Therefore, the spacing can be as follows: For the Date 1 inch line; for Department 2 inch line; for Quantity ¾ inch line; for Item 4 inch double line; for name of foreman, 1¼ inch line. Printed type should not be smaller than 1/16 inch in height.

Too much stress can hardly be placed on the necessity of thoughtful and careful record construction, since nearly ninety per cent of the failure of modern mill records can be laid directly to faulty form construction. It is well also to remember that no detail, however small, should be left to the printer's judgment.

No matter for what purpose a record is devised, the procedure is the same. Several dummy forms should be constructed, drawn in the right proportions as to lettering, before the final decision is made, and the persons who are to fill out the records should be drawn into consultation. No employe is too humble to be unworthy of consideration. Objects and opinions should be carefully noted, not in regard to the purpose of the record, but to determine how far the wording and other instructions are understood.

Antagonism to new things is a human failing, and the opinion of the employes as to whether a record will prove serviceable or not is of very little value, because in the opinion of the average mill help, records are unnecessary.

Before turning away from the principles of form con-

Color..... Size..... *Amount Delivered Weekly.*

Date	Amount Ordered	Date	Received	Lot	Date	Delivered	On Hand	Date	Delivered	On Hand	Date	Delivered	On Hand

Form 31. Stock Record Form Incorrectly Constructed

struction, the importance of observing the above outlined technicalities is demonstrated in the following example.

The exact replica of the illustration (Form 31) has been submitted to the writer for suggestion of improvements.

The notation on the card "Amount delivered weekly" is a sufficient proof that the card was constructed without much thought, a common fault of the majority of mill records, with the result that the record failed to serve the ultimate purpose, if there ever was such a thing in the mind of the constructor. The card was printed on one side only; an unnecessary waste of paper.

The very fact that "Amount delivered weekly" has been written in by hand raises the question whether entries are made once a week only or not. In this case it would be impractical because it would necessitate some kind of additional memorandum or record, showing the daily withdrawals of stock. Such material stock records must be constructed to record withdrawals at any time, whether a month, week or day.

An improved record to serve such purpose is now shown in illustration (Form 32). First and foremost, the headings "Size" and "Color" are placed in the right hand corner of the card. The eyes of any person unless he is left handed will unconsciously follow the right hand and, therefore, right-hand indexing has been adopted as the quickest and most efficient. This necessitates a larger margin for heading and "Size" should be on the first line and "Color" right under it on the second line.

The original record provides for the following information:

What has been ordered.
What has been received.
What has been given out of stock.
What is on hand in stock.

An additional heading "Balance Due on Order" would be

worth while, since this would give valuable information at a glance. An improved form could be constructed in the following manner: One date division for sections Ordered and Received is sufficient. For this section of the card the following successive headings are suggested: Date, Ordered, Balance on Order, Received, Lot No.

The Balance on Order column is kept by adding the quantities ordered and deducting the quantities received; the balance must be, consequently, the lots ordered but not yet received.

Since the purpose of a lot number is to separate the various deliveries, it is customary on stock records to provide a separate account for each lot. Every mill man appreciates the fact that two lots of the same color may differ sufficiently to cause a streaky fabric. If the various lot numbers in stock are separately accounted for, a better control is possible.

The reverse side of the card should be utilized, and in this way a stock card of the same size as the original would be sufficient for eight lots. The length of the card is limited by the average number of entries necessary to use up the lot. On the present size fourteen entries can be made. Should this prove insufficient, the card can be lengthened correspondingly, or, if too long, it should be shortened.

The proper construction of a factory record is not a question of a moment's impulse or an instrument for a temporary relief, but the result of a careful analysis of the purpose and the ultimate requirements. It should show all that is necessary, neither more nor less.

If we turn back to the Chart of Accounts (Form 29) and the Table of Accounts (Form 28), showing how the various accounts are inter-related, the purpose of each factory record is fully determined. But there is another factor for consideration; this is purely psychological.

Changes of any kind are not desirable for any mill;

Size.....

Color.....

Date	Ordered	Balance On Order	Received	Lot No.	Lot No.			Lot No.			Lot No.		
					Date	Given Out	Stock On Hand	Date	Given Out	Stock On Hand	Date	Given Out	Stock On Hand

(Face)

Form 32. Stock Record Form Correctly Constructed

Lot No.			Lot No.			Lot No.			Lot No.			Lot No.		
Date	Given Out	Stock On Hand	Date	Given Out	Stock On Hand	Date	Given Out	Stock On Hand	Date	Given Out	Stock On Hand	Date	Given Out	Stock On Hand

(Back)

Form 32. Stock Record Form Correctly Constructed—(Continued)

workers become set in certain ways and usually resent changes that will disturb their routine. Many grown-ups are not willing to learn, indeed they will protest and even fight all attempts for changes; they will not reason. The antagonism increases under any pressure brought by the management and, therefore, this must be removed gradually by diplomacy.

Raw materials suggest a natural start for organization changes. Such alterations affect the human element of the mill only in a small degree, thus giving ample time for all employes to adjust their mental attitude toward the coming changes instead of having the changes thrust upon them abruptly. It also affords the management an opportunity to demonstrate to the doubting element that a "system" will work without making bookkeepers of everybody in the mill.

Winning Help Over to Changes

This doubting element is present everywhere and usually among the best and steadiest hands. It is made up of methodical workers whose influence over their fellow employes is strong. So the winning of the good will of this class toward the proposed changes is of the greatest importance to the management. As soon as the fears and predictions of these workers are disproved, which can be accomplished more easily when the changes are started in departments which do not enter into their daily routine work, they give in, and the others readily follow. Many efforts to change conditions have been frustrated through the unsympathetic attitude of the employes. They must be won over first and this can be done successfully if the benefits of the change are demonstrated without disturbance. Starting the changes of control with the material control is, therefore, the best course.

CHAPTER XI

CONTROL RECORDS OF MATERIAL REQUIREMENTS

Functions of Raw Material Control

The functions connected with this phase of control are Purchasing and Storing. Purchasing suggests—

Purchase Requisitions
Purchase Orders
Receipt of Goods
Payments

Storing suggests—

Placement of Materials
Store Ledgers
Requisitions

A requisition must precede a purchase and this again must be backed up by something more definite than a desire or the judgment of individuals. This function in many mills is vested entirely with the executive, who uses his judgment and experience as a guide. In other establishments supplies and materials are ordered on the request of a department foreman or even ordered by the worker using the supplies. The results of such arrangements are overstocked or understocked stock-rooms, odds and ends in every corner, dead capital and burdensome stock. It is the system that tolerates such procedures which is at fault; not the individuals who are using their best judgment; and the system should be remedied.

There is a distinct dividing line between Purchase Requisitions for Materials, and Purchase Requisitions for Supplies. The former depend entirely upon the business on hand, while the latter depend upon the rate of consumption.

Control of Material Purchases

The various branches of the textile industry require various procedures and different forms. A cotton yarn mill using one grade of raw material has entirely different requirements from a fancy woolen mill working with half a dozen blends. Again, seasonable articles will affect the procedure. For all purposes, a record should be created to serve the buyer of raw materials with a trustworthy guide covering the requirements of the plant.

A record that will serve as a dependable guide for the buyer of raw materials may be called a Requirement Ledger, Material Ledger, Order Ledger, or Order Register. Its purpose is to show at any time the quantity of raw materials needed for the orders booked by the mill, also what purchases have been made to cover the requirements. There is no standard form of construction, as this varies with the requirements. It may be constructed as one continuous record, combined with the Order Register, or on the flyleaf system similar to the payroll flyleaves. Its sources of information are the orders received daily and its unit, the cost calculations. The construction and operation are demonstrated by the following examples.

Explanation of Order Register

A woolen mill is making a cheap cassimere fabric. It is presumed that this mill has no facilities for sorting and washing its stock, but buys the wool ready for the picker. The cloth requires 15 per cent of wool, 25 per cent of cotton, 60 per cent of shoddy. This is a 20-ounce fabric, and taking

into account the waste that is reclaimed, the actual requirements will be 21½ ounces, or 1.35 pounds of material per yard. The control of materials in this instance is a simple proposition. The mill must have an Order Register which may be in the form shown in the illustration (Form 33), and the necessary additional information can be conveniently carried on this record.

The heading of the Order Register shows that a standard finished piece is 50 yards and the standard stock weight per piece is 67½ pounds, including waste. The first division is for the date. Next comes the order number; then the customer's name, and fourth, divisions for colors or shades. The next three sections are used for Purchasing Register, and are divided into wool, cotton and shoddy. From the Cost Calculation it is known that the fabric contains 13.16 per cent of wool, 21.94 per cent of cotton, and 52.65 per cent of shoddy.

The orders are entered every day and at the end of each week the total number of pieces booked during the week is multiplied by the standard stock weight per piece, and this is divided into the proportions of the various materials indicated under the proper heading. Thus, a dependable guide is created by which the requirements of the mill are covered. In the present example, the entries for the requirements have been made for two successive weeks; the first entries under Total Purchase represent the stock on hand at the beginning of the season, while the additional purchases entered will take care of about twice as many orders as are shown booked up to date.

With the information in this form, material purchases can be proportioned to requirements with certainty. There will be no chasing of raw materials at the end of the season, nor heavy lots of left-overs of one grade or another. The ordinary mill man buying his raw materials on the quick guess method seldom has a cleared storeroom at the end of the season; usually a desirable thing even if the lines do not change from

ORDER REGISTER

Standard Piece *50* Yds.

Standard Stock Weight Per Piece *90.5* Lbs., Including Waste. Season *1917* Style No. *Overcoating 3674A-27 oz.*

Date	Order No.	Customer	Style or Color					Blends								
								AA—41%			*103—21.15%*			*13—37.85%*		
			144	256	391	510	711	Date	Lbs.	Total Requirem't	Date	Lbs.	Total Requirem't	Date	Lbs.	Total Requirem't.
5/5	*1115*	*Broad & Co.*	*3*	*2*	*2*	*1*										
5/5	*1119*	*Wm. Nolls & Co.*	*1*		*1*											
5/7	*1161*	*Cutler & Shears*	*12*	*6*	*6*	*5*										
5/9	*1197*	*Merino Clothing Co.*	*2*	*1*	*1*	*2*		*5/10*	*1670*	*1670*	*5/10*	*861*	*861*	*5/10*	*1542*	*1542*

Form 33. Order Register for Simple Manufacturing Conditions

season to season. On the other hand are instances where the mill bought short and stock used originally is unobtainable or too high in price. Substitution commences, as the orders must be filled and is followed by unsatisfactory goods, returns, disgusted overseers and disgruntled weavers. A review of these difficulties leads to the conclusion that a method of material control pays, and is worth the labor.

Now let us consider a mill in which the line consists of a half dozen or more styles, using the same raw material with variations. The principle is the same, but, of course, the construction is different. To meet extreme possibilities, it has been presumed that such a mill is sorting its own wool, using the various sortings for the blends to make up the styles, also buying some noils. Such a mill would naturally utilize its own low sortings, card waste and hard waste for the cheaper styles.

This mill uses a wool which sorts into 60 per cent medium, shrinking 33 per cent; 23 per cent fine, shrinking 33 per cent; 15 per cent coarse, stained, etc., shrinking 60 per cent; 2 per cent strings, slipes, loss, etc. Therefore, from 100 pounds of unsorted wool they will obtain 40.2 pounds medium, 15.4 pounds fine, 6 pounds of coarse, a total of 61.6 pounds clean, scoured wool, ready for the blends.

The mill buys some noils and the blends are made up in the following manner:

Blend AA, fine sortings, used for warp.

Blend BB, medium sortings, used for warp.

Blend No. 103, 60 per cent medium, 40 per cent coarse sortings, used for filling.

Blend No. 13, 85 per cent noils, 15 per cent card and soft waste, used for filling.

Blend No. 147, 30 per cent card waste, 70 per cent hard waste, used for filling.

The card and soft waste amount to 7 per cent, while the hard waste (garnetted stock) will yield 5 per cent in proportion to the raw wool stock.

The styles made are as follows:

Style No. 3674-A, Warp Blend AA, 41 per cent; Filling, Blend 103, 21.15 per cent; Filling, Blend 13, 37.85 per cent.

Style No. 4200, Warp, Blend BB, 45 per cent; Filling, Blend 13, 55 per cent.

Style No. 5700-F, Warp, Blend BB, 40 per cent; Filling, Blend 147, 60 per cent.

It will be realized that a mill having such a complex problem in its materials will have to limit the sales of the various grades in proportion to its "leader," otherwise the wool must be sorted in a disadvantageous way, or the mill must buy on the market sortings suitable for the requirements, or stock up heavily in various sortings to be used the following season. All of the above causes will cut into the profit, not mentioning the danger of seconds and other production troubles. In no other branch of the textile industry is profit so dependent upon the wise utilization of waste products as in the woolen industry.

The Order Register (Form 34), of which one must be maintained for each style, in this instance will show for each style of fabric, besides the order entry, the various blends used in that style, also in what proportion each blend will enter into the construction of a fabric. These entries are made daily, while the extension of the totals is made at the end of every week. For deductions, such as cancellations and errors, the method of entry is the same, but in red ink, and of course deductions are made instead of additions.

Blend Register

From these pages of the Order Register entries are made

ORDER REGISTER

Standard Piece *50* Yds.

Standard Stock Weight Per Piece *67.5* Lbs., Including Waste. Season *1917* Style No. *Cassimere—1155—20 oz.*

Date	Order No.	Customer	Color					Wool 13.16%						Cotton 21.94%						Shoddy 52.65%					
			A	B	C	D	E	Date	Lbs.	Total Requirem't	Date	Lbs.	Total Purchase	Date	Lbs.	Total Requirem't	Date	Lbs.	Total Purchase	Date	Lbs.	Total Requirem't	Date	Lbs.	Total Purchase
5/3	115	*Johnson & Co.*	3	1	1	2	2				5/1	stock	1440				5/1	stock	600				5/1	stock	4500
5/5	116	*Smith & Smith*	15	8	8	10	10	5/8	608	608				5/8	1015	1013				5/8	2432	2432			
5/12	119	*White & White*	48	48	24	12	12	5/12	1569	2177				5/12	2435	3448	5/10	10000	10600	5/12	5838	8270			
5/15	151	*Chase & Co.*	3	3	2	2	1				5/15	5000	6440												
5/17	154	*Marcus & Co.*	12	8	8	4	4	5/15	466	2643				5/18	761	4207				5/15	1866	10135	5/7	20000	24500

Form 34. Order Register for the Woolen Industry

once a week into the Blend Register. (Form 35.) According to the sorting tests, we have:

Fine sorting, 15.4 pounds of washed wool requires 23 pounds of sorted wool, equals 49 per cent unsorted wool.

Medium sorting, 40.2 pounds of washed wool requires 60 pounds of sorted wool, equals 49 per cent unsorted wool.

Coarse sorting, 6 pounds of washed wool requires 15 pounds of sorted wool, equals 150 per cent unsorted wool.

All the above will sort 23 per cent fine, 60 per cent medium, and 15 per cent coarse. The mill will also have 7 per cent card and soft waste; 5 per cent hard (garnetted) waste.

The construction of the Blend Register is as follows: Sections are provided for each blend. From the Order Registers every week the totals are entered, giving the quantity of each blend required for the orders booked that week.

The next section represents the original sortings. A bale unit of 500 pounds has been assumed, and it is also assumed that the sorting will incur a 2 per cent loss.

Taking 500 pounds as a bale unit, each one will sort, according to the test, into 115 pounds fine sortings, 300 pounds medium sortings and 75 pounds coarse sortings, and each bale of 500 pounds will yield 35 pounds of card and soft waste, and 25 pounds of hard waste. This information is to be marked under the proper headings provided.

Under Blend Proportion, the material required for orders of the various sortings is entered. The percentage, which is the difference between washed and unwashed wool, added will show how much sorted and still unwashed wool is required of the sorting. These entries are entered in the Total column of each sorting.

Blend AA			Blend BB			Blend 103			Blend 13			Blend 147		
100% Fine Sorting			100% Medium Sorting			60% Medium Sorting 40% Coarse Sorting			85% Noils 15% Card and Soft Waste			30% Card and Soft Waste 70% Hard Waste		
Date	Lbs.	Total	Date	Lbs.	Total	Date	Lbs.	Total	Date	Lbs.	Total	Date	Lbs.	Total
5/14	1670		5/14	3750		5/14	861		5/14	1542		5/14	761	
							4365							
		1670			3750		614	5740			1542			761
5/31														

BLEND REGISTER

Bale Unit 500 Lbs.–Loss 2%

Fine Sorting					Medium Sorting					Coarse Sorting				
Sorting Unit–115 Lbs.					Sorting Unit–300 Lbs.					Sorting Unit–75 Lbs.				
Blend Proportion	+ 49%	Total	Short	Over	Blend Proportion	+ 49%	Total	Short	Over	Blend Proportion	+ 150%	Total	Short	Over
1670	2488				3750	5588				2296	5740			
					3444	5131								
		2488		1735			10719		133			5740	3154	
				1735					133				3154	

Card and Soft Waste				Hard Waste				Noils								Unsorted Wool					
Sorting Unit–35 Lbs.				Sorting Unit–25 Lbs.				Bale Unit 500 Lbs.								Bale Unit 500 Lbs.					
								Requirements					Purchases			Requirements		Purchases			
Blend Proportion	Total	Short	Over	Blend Proportion	Total	Short	Over	Blend Proportion	Total	Short	Over	Bales	Total Bales	Date	Bales	Total Bales	Bales	Total Bales	Date	Bales	Total Bales
231				532				1311						5/1	10	10			5/1	100	100
228																					
	459		801		532		368		1311		189	3	3				36	36			
			801				368					3				10		36			100

Form 35. Blend Register for Purchase Control

The next problem is to convert this data into the convenient form of bale units. Since medium wool will yield the greatest quantity of the sorting, this will be used as a basis for transforming pounds into bales. A sorting unit of this grade is taken as 300 pounds. The total quantity of unwashed medium sorting required being 10,719 pounds, this figure is divided by 300, and we find that 36 bales will be required, leaving 133 pounds over. These 36 bales are entered into the Requirements section of unwashed wool, and the 133 pounds left over is entered at the Medium Sortings section into the Over column.

The next step is to determine the relation of the sortings and wastes to this 36 bales. This is done by multiplying the various sorting units by the number of bales. In Fine Sortings it is found that the 36 bales will yield 1,735 pounds more than necessary for the week's orders. This amount is entered into the Over column of the Fine Sortings.

In Coarse Sortings the 36 bales will yield 3,154 pounds less than required, and this difference is entered into the Short column of the Coarse Sortings. In Card and Soft Wastes, 36 bales will yield 801 pounds more than required. This is entered into the Over column of Card and Soft Waste section. In hard waste again the yield of 36 bales is 368 pounds over the requirements. This is put into the Over column of the Hard Waste section. In noils, three bales, which are bought, will take care of the requirements of the week, leaving over a balance of 189 pounds.

During the week the management purchased 10 bales of noils and 100 bales of wool. This entry was made at the time of the purchase in the Purchase column.

The week's entries are ended, a line is drawn and the balance of either over or short is brought forward for the coming week, to be added or deducted from the sorting requirements.

The record now shows with absolute certainty that the

purchases made will take care of about twice as much business as has been booked during the week; also, that there will be an excess of material in the fine sortings, card waste and hard waste, and a considerable shortage in the coarse sortings. The management knows which lines should be pushed and which held back to obtain the proper balance, and will advise the selling agent to this effect. At the close of the season such records in the hands of a capable manager is of incalculable value.

Every mill can put its excessive sortings into a desirable fabric and dispose of it with profit, if they know early enough what sortings will be excessive and in what quantity available. Even if circumstances require the purchase of a wool in which the sorting and shrinking properties are different from the original, the record, nevertheless, stands, requiring only minor alterations.

The woolen industry has been selected purposely for the discussion of the Purchase Control Ledger, because this branch of the industry offers the most complicated proposition. The principles of construction are the same for other branches of the textile industry.

Worsted mills, making yarns only, can easily combine the Order Register with the Material Register, and have headings for tops, noils, card waste and hard waste. Worsted mills making yarns and fabrics should use the above divisions, but provisions should be made for the distribution of the various grades of yarns used in their fabrics.

For cotton yarn mills the Order Register and the Material Register should be combined into one record, reserving one page for each grade of material used. For spinning mills of large size the Material Register may be divided into the various grades of wastes, serving as an index for waste contracts, also for the yearly waste production.

A mill buying its yarn, whether for weaving or for

knitting purposes, needs a Requirement and Purchase Record as much as a mill spinning its own yarn. Such record is illustrated in Form 36. Those who have followed the evolution of modern mill practice from the early slogan of "Scientific Management" of a decade ago will understand why such radical departure has been made from the usual methods of that period. Experience means progress, and today we look more for the causes than for the effects. The most common forms of production inefficiency can be charged to the deficient methods of material control. Unless the management knows definitely the actual requirements from week to week, buying materials will be a gamble; and invariably the mill will be "short" or "over" in one or another grade of raw material.

Waiting for materials disturbs the working schedule, will cause haste, substitution, and many times the use of higher priced raw materials. All of these cause inefficiency and increased cost of manufacturing. The cost and trouble of keeping such a record is but a trifle. Its advantages are too many to recount.

Form for Weaving or Knitting Mill

The examples shown previously have been worked out for a weaving plant making fancy fabrics. For a knitting mill, practically the same form should be developed, but of course with such changes of the headings as are required by this branch of the industry. In such a case, instead of warp and filling, the definitions will be, body, splicing, heel and toe yarns, or tops, cuffs, etc. In the case of hosiery or underwear plants, where most goods are dyed after the knitting process, the color divisions are eliminated, wherever unnecessary. The "Units" are also changed, depending on the size of the plant, to one dozen, hundred or a thousand dozen, whichever may prove convenient for the plant. But the method of development and manner of control is identical with that of a weaving plant, given as an illustration. (Form 36.)

It has been presumed that the mill is making five styles, using five grades of yarn. The weight of the piece and the proportion of the various grades of yarns have been determined for each style and this is entered under the various style headings. Space has also been provided for color divisions, totals and balance. The orders are entered every day and the balances extended. At the end of each week this part of the record is closed. The week's balances of each style are obtained by deducting the present balance from last week's and this multiplied by the yarn weight of the style gives the total yarn requirements.

Again, this multiplied by the various yarn factors gives the yarn proportions, which are now entered into the second part of the record under the proper yarn headings. After all yarn requirements have been distributed the totals are extended, and by using a yarn unit (which in this case has been established as 500 pounds) we have the week's material requirements. This is entered for each grade of yarn in the Requirements section and added to the total. A line is drawn to indicate the week's entries, and the Short and Over balances are brought forward to be added to or deducted from the coming week's yarn proportions, as explained in connection with a previous form.

Requirements are Known

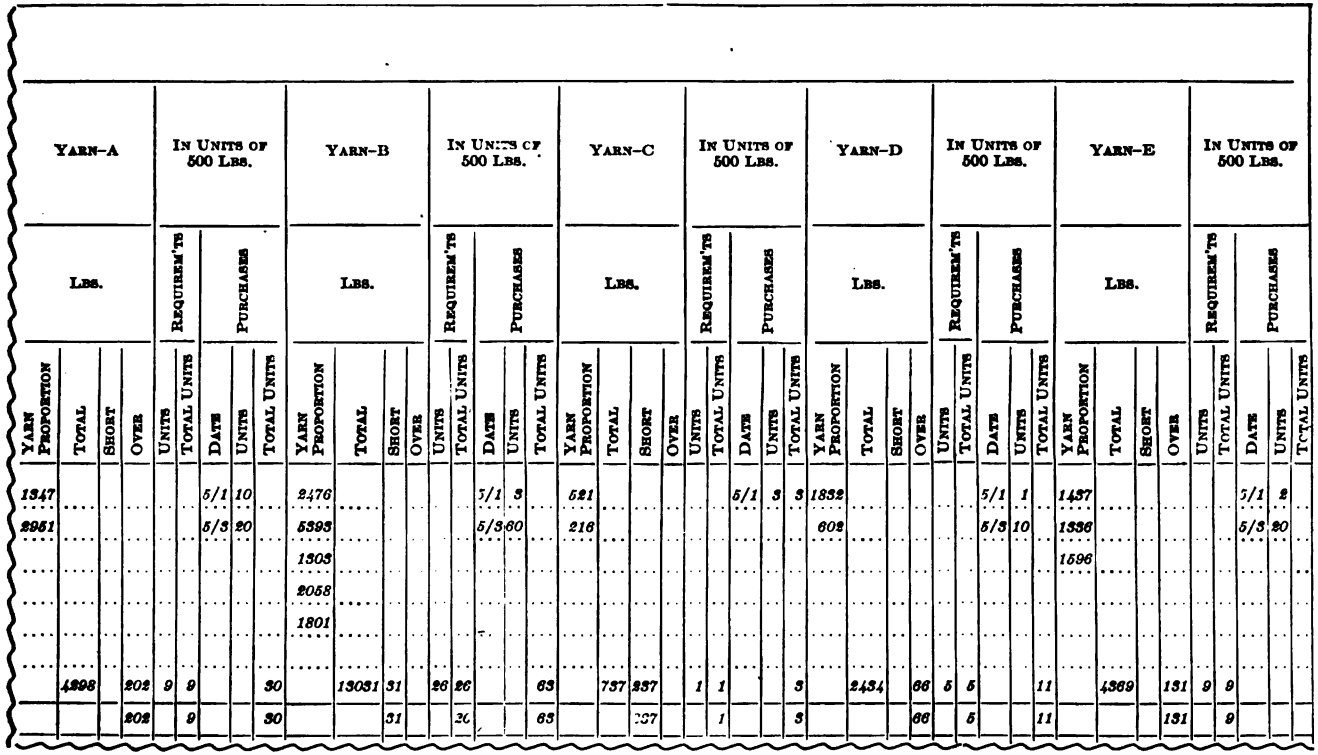
In this way the yarn requirements of the season's orders are known. The purchases are entered on the date ordered and the totals extended. To balance the purchases with the requirements of raw materials with the help of this record requires no superhuman qualities and the mill is saved a great deal of disappointment, production disturbance and expense. To overcome the unhandy appearance of the record in its excessive length, it should be divided into leaves with registering lines, similar to the divided payroll ledgers.

ORDER, YARN REQUIREMENT AND PURCHASE RECORD (Closed Weekly)

			TENNIS							VICTORIAN							DIXIE							HAVANA							FLIRT						
			Standard Piece 60 Yds. Standard Weight 15 Lbs. Yarn Weight 16.06 Lbs.							Standard Piece 60 Yds. Standard Weight 18.75 Lbs. Yarn Weight 20.07 Lbs.							Standard Piece 60 Yds. Standard Weight 15.15 Lbs. Yarn Weight 14.04 Lbs.							Standard Piece 60 Yds. Standard Weight 15.15 Lbs. Yarn Weight 14.04 Lbs.							Standard Piece 60 Yds. Standard Weight 11.81 Lbs Yarn Weight 12.65 Lbs.						
			Yarn–A–31% Yarn–B–57% Yarn–C–12%							Yarn–A–29% Yarn–B–53% Yarn–D–18%							Yarn–E–45% Yarn–B–39% Yarn–D–16%							Yarn–E–37% Yarn–B–57% Yarn–C– 6%							Yarn–E–47% Yarn–B–53%						
			COLORS					PIECES		COLORS					PIECES		COLORS					PIECES		COLORS					PIECES		COLORS					PIECES	
DATE	ORDER NO.	CUSTOMER	1	11	27	32	41	TOTAL	BALANCE	1	11	27	32	41	TOTAL	BALANCE	1	115				TOTAL	BALANCE	1	11	32	115		TOTAL	BALANCE	1	32	115	29	61	TOTAL	BALANCE
5/1	115	Charles & Co.	30	15	30	60	15	150	150	120	90	90	45	15	360	360								15	15	30	7		67	67							
5/3	116	The Fair	3	6	3	3	3	18	168								15	7				22	22								15	30	7	7	3	62	62
5/3	210	Brand & Morris	15	30	30	60	15	150	318															15	60	30	30		135	202							
5/4	117	White & Co.	7	7	7	7	7	35	353	15	7	15	7	7	51	411	3	3				6	28	15	9	9	9		42	250							
5/4	211	Cohen & Leary								30	30	15	15	7	97	508	60	30				90	118								60	60	30	15	15	180	248
5/5	212	Field & Co.	120	120	60	30	15	345	589								60	60				120	238	120	120	60	60										
5/6	213	J. Weaver	30	30	15	30	15	120	718																						7	7	7	5	5	27	269
5/7									718							508							238						250							269

(Right Side)

Form 36. Order Register, Arrangement for Fancy Weaving or Knitting Plant



YARN-A				IN UNITS OF 500 LBS.					YARN-B				IN UNITS OF 500 LBS.					YARN-C				IN UNITS OF 500 LBS.					YARN-D				IN UNITS OF 500 LBS.					YARN-E				IN UNITS OF 500 LBS.				
LBS.				REQUIREM'TS		PURCHASES			LBS.				REQUIREM'TS		PURCHASES			LBS.				REQUIREM'TS		PURCHASES			LBS.				REQUIREM'TS		PURCHASES			LBS.				REQUIREM'TS		PURCHASES		
YARN PROPORTION	TOTAL	SHORT	OVER	UNITS	TOTAL UNITS	DATE	UNITS	TOTAL UNITS	YARN PROPORTION	TOTAL	SHORT	OVER	UNITS	TOTAL UNITS	DATE	UNITS	TOTAL UNITS	YARN PROPORTION	TOTAL	SHORT	OVER	UNITS	TOTAL UNITS	DATE	UNITS	TOTAL UNITS	YARN PROPORTION	TOTAL	SHORT	OVER	UNITS	TOTAL UNITS	DATE	UNITS	TOTAL UNITS	YARN PROPORTION	TOTAL	SHORT	OVER	UNITS	TOTAL UNITS	DATE	UNITS	TOTAL UNITS
1347						5/1	10		2476						5/1	3		521									1852						5/1	1		1437						5/1	2	
2961						5/3	20		5393						5/3	60		216									602						5/3	10		1336						5/3	20	
									1503																											1596								
									2058																																				
									1801																																				
	4298		202	9	9			30		13031	31		26	26			63		737	237		1	1			3		2434		66	5	5			11		4369		131	9	9			
			202		9			30			31			26			63			237			1				3					5			11				131		9			

(Left Side)

Form 36. Order Register, Arrangement for Fancy Weaving or Knitting Plant—(Continued)

The question that will naturally follow is how such a material control will work where the delivery of goods is set for certain dates and consequently in the purchase of raw materials such delivery dates must receive consideration. *In such a case a complete set of records should be reserved for each delivery division, but otherwise the method of entry is the same.*

The only branch of the industry where a change of form construction is necessary is silk manufacture. Finished silk fabric carries a certain proportion of weight added during the dyeing process. If this additional imparted weight is equal to the loss sustained during the degumming process no change of form is necessary. If the weighing is above par, the difference between the fabric weight and the raw silk weight should be deducted before making the extensions of the Requirements section. A column should be provided to show such weight deductions.

CHAPTER XII

THE CONTROL RECORDS OF SUPPLIES AND SUPPLY PURCHASES

In most mills the purchase of supplies is separated from the purchase of raw materials. This should form a distinct department and wherever supplies have been standardized the method of control and purchase has been developed to suit the requirements, which are entirely different from that of the raw materials.

Incompetency and carelessness are usually the causes of increased requirements for supplies, and a rigid control is the only remedy. There is no first and last place of importance in mill supplies; all are important. This is the reason, in mills where a modern supply control has not been adopted, that the supply inventory is from two to ten times higher than necessary. A mill man justly dreads to be short of supplies, so he orders "enough," which is usually too much. In spite of this, some things are usually overlooked with resulting delays and extra expense.

To remedy such conditions, and reduce the capital tied up in supplies, the maximum and minimum control method should be adopted.

In every case when ordering supplies the following factors need consideration:

The rate of consumption
The time required for shipment
Advantages gained through shipment in quantities

Price reduction gained through buying in quantities
Condition of the market
The possible depreciation of value through storing
The desirability of connection

Actual examples will illustrate the desirability of analyzing the supply requirements in this manner. In one mill, before this method was introduced, they had constant trouble with the bobbin supply. The mill was located far from the source and it required from four weeks to two months for a shipment to arrive. A shortage caused serious production disturbances, and many times heavy cases had to be shipped by express to prevent the stopping of machines. After a modern supply control was inaugurated only a limited quantity of bobbins were given out to the departments, and from the requisitions the monthly rate of consumption was determined.

For shuttle bobbins it was found that 1,000 bobbins was a safe monthly consumption factor, and since the shipment limit was two months, the low stock limit was established at 2,000; with the high limit at 5,000, or a five months' supply. The same method was applied for all bobbin requirements, and the mill was never short again.

In another instance, in spite of the fact that the mill carried a heavy stock of machine reserve parts there was a constant shortage and heavy express bills. Through determining the rate of consumption, in a few months' time this mill succeeded in regulating the shipments; machine part orders were sent out only twice a month; the shipments were made in lots, thus cutting the cost considerably, yet it was a rarity when a requisition from the mill for machine parts could not be filled promptly. Furthermore, in one year the inventory of machine parts was reduced considerably.

There is no article of supply for which a high and a low limit cannot be established. It will require effort to do it, but

after it has been established, the control is purely mechanical. The high and low limits are marked on the stock cards, and the bookkeeper, when the stock of an article reaches the low limit, makes out the notification (Form 37) to the office or purchasing agent to order more material.

No. Date.....

To Purchasing Department

.....

Reached Low Limit of.....Last Lot

Received From.....in Quantity of

.....Time Required for Delivery

.....

.....

Store Keeper

Form 37. Purchase Department Notification of Low Stock

In large mills where the supplies and materials run into millions, an organization trained and equipped to handle the business of purchasing exclusively is imperative, and such mills should have purchasing departments. But while all mills cannot afford a purchasing agent, nevertheless, no mill should regard this as an obstacle and hesitate to adopt the methods employed at the largest establishments. The buying of supplies and sundry materials should be in every instance concentrated under one person and under no circumstances should the various department heads assume the responsibility of purchasing.

Our ethics and methods of buying have changed, and few mills today buy on a friendship basis. Everyone wanting to sell something should be listened to; even if a mill has a year's supply ahead in the article offered, a seller should be allowed to tell his story—in the interest of the mill. But the executive

cannot always take the time to listen to everyone sending in his card without neglecting more important work. Hence the necessity for adopting modern purchasing methods.

Purchasing requires certain standardized procedures, certain forms which are just as important as the stock control itself. The actual routine connected with the purchase of supplies should be entrusted to an assistant, and the methods of procedure as firmly defined as for any other function of the management. The purchasing agent might perform many other duties besides purchasing, should the employment of a man for this specific purpose be unwarranted, but in all cases the duties are as follows:

1. Interviewing all calling salesmen.
2. Handling all mail relating to purchasing.
3. Studying and following up systematically the market for all supplies and materials, and advising the manager of all important changes.
4. Receiving quotations from all possible sources.
5. Making out the orders, which are either signed or countersigned by the manager.
6. Following up shipments of supplies to prevent delay in delivery.
7. Taking up all complaints from the mill in reference to materials and supplies.

Purchasing is today one of the weakest links of mill organization, whereas it should be one of the strongest. This is because the importance of a standardized purchasing procedure is not as yet realized in many textile mills. The forms and records of an organized purchasing department will, of course, vary with the size of the mill, but under all circumstances they should include the following:

Quotation card (Form 38); one card for each article, indexed according to articles.

ARTICLE					NO. OR SIZE			FILE NO.
DATE	FIRM'S NAME	QUANTITY	UNIT	PRICE	DIS.	TERMS	F.O.B.	REMARKS

Form 38a. Quotation Record Card

Article. *Glauber Salt* Unit. *100 lbs.*

QUOTATIONS

HOUSE	DATE	PRICE	TERMS	DATE	PRICE	TERMS	DATE	PRICE	TERMS	DATE	PRICE	TERMS
Yellow & Co.	*1/17*	*.62*	*2/10*	*3/21*	*.71*	*2/10*	*5/10*	*.70*	*2/10*			
WesternChem.Co.	*2/19*	*.69*	*2/10*									
Porter & Porter	*3/1*	*.68*	*2/10*	*3/15*	*.70½*	*2/10*						

Form 38b. Quotation Register Card to Register Several Quotations from the Same Source

Request for quotation (Form 39), with a stub, to be filed away as a follow-up.

Purchase Order (Form 40) *made in triplicate,* the original being sent to the seller, the duplicate filed according to date for follow-up, and the triplicate, without the price and quantity, sent to the receiving clerk for reference, and as receiving record.

Catalog library (Form 41), for catalogs, price lists and samples; well-kept and indexed.

REQUEST FOR QUOTATION

SMITH MANUFACTURING CO.
Smithville, Mass.

Date.....191...

To.....

Address.....

Please make quotations for the following articles

Delivery wanted by..... **Smith Manufacturing Co.**

.....

Form 39. Requisition for Quotation

These are the mechanical means. But these are only half the requirements for success on the part of the purchasing department; the other half consists of the personal element. The ability to cut the time spent in interviewing salesmen, to quickly distinguish the worth while from the uninteresting, the grain from the chaff, is the art of the purchasing agent. This is not necessarily a natural gift; it can be acquired.

The Quotation Card, as the name suggests, is an index memorandum of the sources and prices of the various supplies.

A salesman or a sales letter from a new concern offering

PURCHASE ORDER

Order No..... Requisition No.....

SMITH MANUFACTURING CO.

Put these numbers on all packages and invoices.

Smithville, Mass.

Date.....192...

To.....

Address.....

Please supply and deliver to the above address the items listed below

To be shipped.....

By.....

Smith Manufacturing Co.

by.....

Please acknowledge this order by numbers and state when delivery will be made.

Form 40. Purchase Order

mill brushes, for instance, may not interest you today, but the name and the prices should be put down with the date on the quotation card; it will be interesting when the mill is in the market for brushes.

The Request for Quotation form is usually similar to the Order Form, but having printed across with large hollow letters, "This is Not An Order." The Order Form should contain all printed information the mill wishes to tell each seller and should have the spacing arranged to facilitate filling out the orders as quickly as possible. Many order forms are constructed with detachable stubs containing a printed acknowledgment, which is signed and returned by the seller.

Orders are usually made in triplicate, or even more copies are made; the original going to the seller, the duplicate remaining in the purchasing department for follow-up and to make the necessary entries into the Requirement Register, or Stock Records; while the triplicate—this without prices and quantity —goes to the receiving clerk or the employe entrusted with the receipt of goods.

Location	Belt Dressing
B 13	*Acme Petroleum Products Co.*
B 37	*Graton Knight Co.*
B 109	*Chas. A. Schieren Co.*

Form 41. Form for Indexing Catalogues

An important, but very often neglected duty of a purchasing department, is the follow-up of shipments. The purchaser of supplies should be familiar with freight rates and transportation conditions. Many thousand dollars are wasted today through careless routing of shipments and a proper attention to this detail will, even in a moderate sized plant, pay the cost of labor and stationery in an organized purchasing department.

A few words may be said regarding the method of receiving shipments. Only one person in a mill should have the authority to sign for received shipments, and of course this employe has to make out a receiving record in duplicate. The original goes to the purchasing agent, where it is attached to the invoice, and after comparison sent to the accounting department. The duplicate is sent with the goods to the store room, and the storekeeper signs the receipt and sends it to the office, to be charged on the stock ledger.

To assure that the stock has reached the proper destination and that the entry in the stock ledger has not been neglected, the rule must be established that no invoice should be prepared for payment unless both receipts, the original and the duplicate, are attached. The stock ledger clerk, after charging the proper account with the goods received, sends the duplicate receipt to the accounting department and the person responsible for the proper payment of the bills will investigate should a duplicate not reach him in due time.

Supplies, Their Physical Control and Control Records

Proper control of all supplies and materials in a mill is imperative; no mill is small enough to make such control unnecessary, nor large enough to make it impossible. A warning should be given, however, against the custom of adopting a system that has proved successful in some other mill where

the conditions perhaps are greatly different. A control system should not be adopted; it should be developed to meet the particular needs of a particular business. There are hundreds of forms and methods in use none of which can be selected and given as the one particular method or set of forms that are the best.

One of the first matters to be decided in developing a system is how far control should extend in order to be adequate, but not excessive or burdensome. The requirements may be stated as follows:

The control system should supply the office with dependable information as to the rate of consumption, otherwise the monthly burden of the mill cannot be determined, and also with definite proof that the supplies have been used as economically as possible under the circumstances.

It should not require too many forms or too much clerical labor on the part of the mill employes; in other words, it should be free from red tape. A system that burdens the mill with too many requisitions or forms to be made out will soon become very unpopular and will not be carried out.

It should not be expensive. The cost of upkeep in clerical labor and stationery must not be excessive.

The forms, while important as the vehicles of information in a system, are really secondary to the method and this should be taken up first. The size of the mill, the article, and the local conditions are the factors which should decide the method to be followed in the control of stock, and not such factors as the success of a particular system in some other mill, or how well a certain set of stock control forms looked in this or that book.

A small plant, where the cost of mill supplies (with the exception of coal) does not exceed three thousand dollars, and where a close personal supervision is possible, will not need a stock supply ledger at all. The supply account of the pro-

duction ledger, subdivided into the main departmental divisions, will give all the data needed for the monthly check of manufacturing burden, so a stock card and a daily report of supplies received and given out is sufficient information for the management, for purchase as well as for control purposes. More records of forms would mean unnecessary labor and expense.

Of the greatest importance in a supply control system is the method of handling the supplies. No quantity of books or records are of any use when the supplies are scattered all over the mill, and liable to abuse and careless handling. Any mill, whether large or small, should have a supply stockroom in charge of somebody who is responsible for the stock. When the cost of the supplies of every kind is high, this necessity for proper handling is more readily perceived. Supplies should be kept in standardized stock rooms, handled with extreme care and given out to the mill in limited quantities. Volumes could be written about supply abuses in textile mills, but a peep into tool boxes, supply closets and odd corners in almost any mill will show the need for changes in the common practice in handling supplies.

The first step for most mills is, therefore, the establishment of a centralized stockroom, where all supplies and spare machine parts are kept in good condition on shelves or in bins. From a small mill, where a 10 x 10 foot floor space has been wired off, to a big mill where a whole floor is used for the purpose, the principle of keeping supply stock in good condition is the same. For every article there should be a Stockroom Record.

A large mill should have a stock clerk in charge, while in a small mill the work may be assigned to the shipping clerk or an office employe.

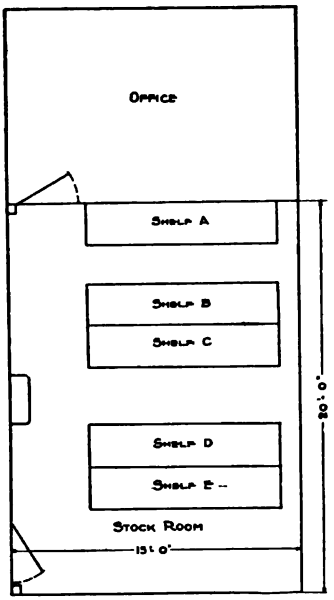
In large mills, of course, the method of providing the factory with the various supplies will differ from that in a

small establishment, where the overseer or some other person in authority obtains the necessary articles from the supply room. Under no circumstances should a foreman be burdened with the responsibility of the supply stock. A foreman's duties are too manifold for him to give the necessary care to the stock and such an arrangement will never be satisfactory.

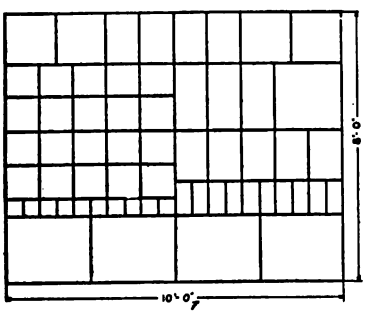
Before going into the discussion of a departmental stock control, descriptions of two control methods will be interesting; one is in use in a small knitting mill, where the supply and material stock is in charge of the bookkeeper, and the other is in a large cotton mill, where the supply room is in charge of a clerk. These descriptions serve to show the lines of procedure and organization along which the stock control system of almost every mill can be developed.

The following instructions for the organization of the supply stockroom of the B-Knitting Mills were prepared and a copy of these instructions, together with the sketches (Form 42) was handed to the carpenter hired for the job.

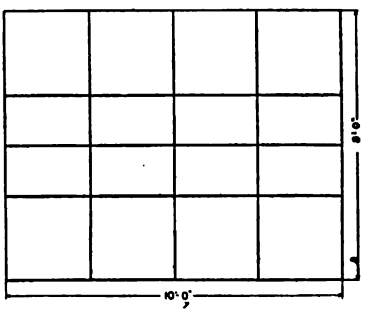
> A space 15 x 20 feet in the factory at the left end of the office partition will be cleared of all machinery, tables and boxes. The carpenter will cut a doorway leading to the office at a distance of five feet from the right hand post, the door when hung to be provided with a latch lock. He will enclose the cleared space with No. 2 wire mesh, fastened to 8 foot wooden frames. At the extreme right of the enclosure, a doorway will be cut opening into the factory and the door equipped with a latch lock opening from the inside. The door will be paneled with sheet iron around the latch in order to prevent opening through the meshes from the outside. Six feet from the door, and at a height of four feet, a 3 x 3 foot window will be cut, with a shelf, one foot wide from the inside. An electric bell leading to the office will be attached outside the window. Shelving as per sketches will be erected in the stock room. The shelving is to be made of ⅞-inch pine lumber,



Plan of Supply Stock Room in Small Knitting Mill



Elevation of Shelf A; to be used for Supplies; Shelves of all Sizes to Provide for a Variety of Stock Without Waste of Space



Elevation of Double Shelves B; to be used for Yarns in Bundles and on cones

Form 42. Sketches of Floor Plan and Shelving for the Stock Room of a Small Plant

It was decided that to obtain the proper proportion of monthly supply burden it will not be necessary to divide the mill into operations, a burden charge in relation to total direct labor being sufficient, so in the Production Ledger a single supply account had been opened to which all supply bills and supply freight charges were charged. This, of course, eliminated the Supply Ledger, a record unwarranted for a mill of this size.

A Stock Record was constructed, the same form to be used for both materials and supplies. Since only the foreman was entitled to draw materials, the conventional requisition was eliminated and a Daily Stock Report (Form 43) designed, serving all purposes, including a record of the receipt of all kinds of goods, a check on the stock records, and a handy report for the manager as to the arrival and use of all materials and supplies.

DAILY STOCK REPORT

Date.....

Received			Given Out		
From	Article	Quantity	Article	Dept.	Quantity
.....	.....	.....	.....	.....	.....

Form 43. Daily Stock Report of Supplies Withdrawn from Stock Room Suitable for a Small Plant

After the stockroom was completed each section was marked with the shelf number of the original plan and every bin in each section was given a number. Then the following instruction was given to the bookkeeper:

Beginning Monday, November 15, all materials and supplies will be under your direct charge. Shelf A is to be used for supplies only, while shelves B, C, D, and E are for materials. Cases, bales and other bulky materials are to be placed in the open space provided for this purpose. The supply shelf has spaces of all sizes to accommodate the various articles without waste of space, and every space has a number for convenient identification. The foreman has been instructed to move all supplies into the stockroom, and assist in assorting and placing the stock on the shelves.

For each article a Stock Record is to be maintained, giving the name and exact location, also the quantity; this last information being entered on the first line in the "Balance" column. The management will fill out the "Maximum" and "Minimum" also the "Time Required for Delivery" spaces. The cards should be arranged in alphabetical order according to the names of the articles. When goods are ordered, you will enter into the "Ordered" column the date, the source and the quantity.

A Daily Stock Report has been constructed and all receipts of goods should be here recorded and the information transferred daily to the proper Stock Records and the "Balance in Stock" corrected.

Only the foreman is authorized to draw supplies, and all supplies given out must be at once recorded on the Daily Stock Report in the "Given Out" columns, noting which department has drawn the supplies. The information in the "Given Out" columns is transferred daily to the Stock Records and the "Balance in Stock" corrected. It is one of your important duties to notify the manager as soon as a stock reaches the minimum limit and he will order the maximum quantity immediately.

Both doors of the stockroom must be kept locked and a bell has been provided near the delivery window to notify you when stock is wanted. Calls must be answered without delay. During the first week of every month the stock should be charged against the stock cards and any discrepancy in quantity corrected. We expect you to take a personal interest and pride in the appearance of the stockroom.

With these instructions for a definite task, given in a

definite form, the bookkeeper needed hardly any further explanations as to his duties and responsibilities.

Simultaneously with the above instructions to the bookkeeper, the foreman was given the following notice:

> Beginning Monday, November 15, all supplies and materials will be under the charge of Mr. M. You are requested to move at once all supplies from your department into the new stockroom and assist Mr. M. in properly placing the stock. No supplies or machine parts of whatever nature should be kept in the mill unless for immediate use. The management fully realizes the manifold duties of an overseer and feels that the burden of the care of the supply stock should be placed elsewhere. At the same time a strict control of the supplies being imperative, it has been decided to establish a centralized stockroom.
>
> Only you have authority to draw supplies. A bell has been located at the delivery window of the stockroom and Mr. M. has been instructed to answer such summons without delay. It is hoped that you, now being relieved of the care of the stock, will find these improved conditions helpful in checking the careful and efficient use of supplies by the employes in your charge.

It should be remarked that before a single step was taken toward improvements of supply control, the management as well as the writer carefully studied the situation, worked out a careful plan and had several consultations with the foreman and the bookkeeper. While at first they professed to be somewhat irritated by the management's taking up the subject of the use of supplies, a little diplomacy soon dispelled this feeling and their co-operation was secured.

Without co-operation no method or system for improvement was, or ever will be, successful. The changes did not come abruptly, but fell on prepared ground. The men were given definite written instructions and had little opportunity to use their imaginations to construct phantom hardships and humiliations that might result from the new system and control.

It is worth while to dwell on this point. The best intentions, an excellent plant, the most complete system of control, with every advantage for the employes, will be a complete failure unless the execution is carried out with the utmost diplomacy. The average individual is suspicious of all changes, and will misconstrue the most innocent change as a dire conspiracy to rob him of his wages and prestige, if his imagination be given a free rein.

The first rational step toward improvement in mill control is the standardization of the supply stock; it is the first one that will affect the mill employes, and the greatest care and thought should be given to the development of the most suitable method, and a system that will result in the least inconvenience to the workers; and then to the careful presentation of the change.

When the stock had been moved to the stockroom in the above cited case and the stock cards filled out for each article, the inventory disclosed many items of supplies, which had been forgotten and buried under the work bench among odds and ends of scraps. "It won't happen again," the foreman apologetically said to the writer. "The help will be more careful, and I'll know what's used."

Supply Control for Large Organizations.

In the case of a large cotton mill the problem to be solved was of an entirely different nature. The mill used many thousand dollars' worth of supplies a year. In this instance, too, the supplies were in charge of the various overseers who, having no time to give out supplies personally, had constant trouble and almost a hopeless task in trying to enforce economy. Shortly before the reorganization of the control system was decided upon, an enterprising worker with a streak of personal economy discovered that heavy double belting

makes an excellent, durable and flexible shoe sole and availed himself of the opportunity, with the prevailing loose control method, of resoling his working shoes with this expensive belting. The habit spread to other workers before being discovered. This discovery, and the fact that a case of heddles was somehow mislaid just when needed most, brought the request from the overseers themselves for an improved supply control method. The mill having only a crude cost system, naturally the two systems were worked out together. This was one of the rare instances where improvements were not only welcomed by the majority of the overseers, but were actually demanded, and, of course, the management had their co-operation. Even so, every step was previously explained to the overseers and points of doubt carefully cleared up.

The mill had many departments, generated its own power, and had quite an extensive repair shop, and the concentration of all supplies was not a simple task. It was decided that a room on the main floor should be turned into a supply room in charge of a special supply clerk. The floor was carefully laid out, and a construction order was made. Sections were assigned to articles used in one department only, with other sections assigned to articles in general use throughout the mill. The stockroom contained everything, from brooms to castings, and from washers to darning needles, and a Stockroom Bin Record was made for each article.

Provision was made under the new system for each department to carry a limited stock of each article in specially constructed closets which had bins of various sizes, each one numbered. Inside of each closet an alphabetically arranged list of all articles was posted, giving the number of the bin in which each article was located. Every section hand had a key to the closet and took supplies as needed. The quantity carried in these closets was calculated to be sufficient for one week in articles of everyday use and was added to regularly; while

supplies and machine parts not in everyday use were ordered as needed. A small closet in each department was sufficient for the needs, and was kept in good order by the neatest section hand, who was entrusted with this duty; and since the rearrangement of the closet meant additional work for him, he kept an eye on his slovenly brothers, who would rather submit to the rule of neatness than to the nagging of the man in charge.

The supply room had a messenger system, and most supplies were ordered by telephone and sent to the departments, and there was less delay than previously when the hands themselves had to scout their floors very frequently for certain machine parts, belts or other supplies.

Article ..... *Heddles No. 5x11½* Account No. *L-51*

Unit *1000*

Received						Given Out			In Stock		
Date	From	Quantity	Amount	Charges	Total Cost	Date	Quantity	Value	Quantity	Unit Value	Total Value
									1,550	*10.41*	*16.14*
						5/7	*500*	*5.21*	*1,050*	*10.41*	*10.93*
						5/21	*500*	*5.21*	*550*	*10.41*	*5.72*
5/21	*H. N.*	*10,000*	*100.00*	*2.55*	*102.55*				*10,550*	*10.27*	*108.35*
						5/25	*500*	*5.14*	*10,050*	*10.27*	*103.21*

Form 44. Stock Room Record

Goods were given out on a requisition only, signed by the foreman, and handed to the messenger when the supplies were delivered.

The stock clerk credited his Stockroom Records (Form 44) during the day and marked on the Requisitions the letter of the department to which the goods were to be charged. The maximum and minimum stock worked automatically, and the purchasing department was notified as soon as the stock reached the low limit. The stock clerk had a pigeon hole arrangement, with numbers corresponding with the stock ledger accounts, and requisitions credited to the Stockroom Records were filed under the account number.

The size of the business required a Supply Stock Ledger (Form 45) for each article, showing at all times the value and the quantity of supplies in stock. The requisitions, already assorted as to account numbers, were sent to the office every Saturday, and the Supply Stock Ledger Accounts were

Article *Heddles No. 5x11½* Location *D-69*

Unit *1000* Account No *L-51*

Maximum Stock *10,000* Minimum Stock *1000*

Time Required for Delivery *4 Weeks*

Ordered			Received			Given Out			Balance in Stock
Date	From	Quantity	Date	From	Quantity	Date	Dep't	Quantity	
									1650
						5/3	L.	600	1050
5/3	W. M.	10000				5/16	L.	500	550
			5/21	W. M.	10000				10550
						5/26	L.	500	10050

Form 45. Supply Stock Ledger

credited with very little additional work. The ledger clerk also had a pigeon hole arrangement, but this corresponded with the Production Ledger Accounts, with subdivisions for "Maintenance" and "Equipment." The requisitions were filed ready for the Production Ledger, and the entry was made at the end of each month with no more additional work than adding up the requisition values already grouped to ledger numbers.

There is a great deal of uncertainty among mill men and accountants as to the classifications "Supplies," "Maintenance" and "Equipment." As to actual supplies, the question is not so perplexing, and the following list, while incomplete, will give a clear idea of its nature: Coal, oils (lubricating), brooms, brushes, belt dressing, bobbins, shuttles, dry boards, jacquard cards, stationery.

But what constitutes maintenance and what new equipment is a bit confusing. A thing may be new equipment at one time and maintenance another time. For example, take reeds; if bought for making a new article they are manifestly new equipment; if used for replacing worn-out reeds, they are replacement of equipment. In each case one must depend upon individual judgment.

While in some mills such subdivision is unnecessary, in many others it is essential. Take a mill making novelties. In this case it is imperative to know what capital was invested in equipment to make the article; did it pay to spend this money on a season's business.

Many mills, tempted by the attractive looking selling price on short-lived novelties, forget momentarily the expense of new equipment, consoling themselves that the equipment will be used some other time. The "some other time" might not come in a decade, the special equipment eating up its value and earnings in interest and depreciation. If the cost of equipment of such special supplies is shown in its proper place,

it will indicate to the keen manager how much business in these seasonal novelties must be done for the equipment to pay for itself, also whether such equipment is capable of producing this paying quantity and earning a profit. The cost organization of a mill falls short of its purpose unless it is capable of assisting the management with such problems. In other words, a cost system, no matter how elaborate, is unscientific, and but a useless jumble of figures if it lacks such analytical features.

A mill should know what is new equipment and what is replacement. Another very important reason why distinction should be made between equipment and maintenance is the Federal Income Tax Law. You are entitled to increase the valuation of equipment with every new addition, whether it is a new machine, a new set of reeds or other auxiliary equipment, *provided this equipment is not used for the replacement of worn out equipment.* Distinguishing between these two will require but a little more attention on the part of the accountant in charge, but results in a check upon the use of supplies in all departments. Department heads can soon be taught to make this distinction on the requisitions and mark them (m) for maintenance and (e) for new equipment.

These are the feature problems of the construction and maintenance of supply accounts and supply stock rooms, their control and enforcement of economy. With the descriptions of the two instances given, the subject is by no means exhausted; but what has been said will give a fair idea of the proper procedure, and proof why a cost or stock control system must be developed in each instance to meet the peculiarities of a mill.

One more feature should be discussed here. A supply stock room should house not only new articles, but all machinery parts and supplies not in actual use in the mill. The exception is change gears and machine parts of similar char-

acter. A stock room should have a distinct space reserved where heddles, reeds, harnesses or sinker heads, for instance, that are already charged to the departments, should be housed.

Stock cards for such supplies are carried as well, but are marked "Charged Stock," and, of course, they have no ledger accounts. A set of harnesses and reeds, for instance, taken out of a loom with no prospect of immediate use, is sent to the stock room, entered on the "Charged Stock" card, and if at the next occasion for use a requisition is sent for the identical supplies, the "Charged Stock" card is looked up first, the identical set returned, and no charge made, the requisition being destroyed. If no charged stock is available new stock is, of course, given out and proper charges made.

There is another very important factor in favor of perpetual stock records and control method. The danger of fire is ever present in every mill. The presence of such records leaves but one way for the insurance adjuster—to pay the inventory value without argument.

CHAPTER XIII

RAW MATERIALS, THEIR PHYSICAL CONTROL AND CONTROL RECORDS

The ultimate aim in controlling both supplies and materials is to have immediate and dependable data on the condition and quantity of stock on hand, and supply information necessary for the cost department.

The method of stock control is similar for large and small plants, but the details will depend on the size of the business. If the plant is so small that the expense of a store clerk is unwarranted, the system described in the previous chapter will meet the requirements. However, such very small plants are rather an exception than the rule, and after due consideration most mills will find the employment of a store clerk a good investment. His duties may be consolidated with those of a shipping clerk, or some other function, but under no circumstances should a foreman of a department be burdened with storekeeping, as he will neglect his departmental duties for the sake of record keeping, or vice versa.

During many years' experience in organization work, in almost every branch of the industry, the writer has failed to discover a single instance in which a foreman responsible for stores could perform the work satisfactorily. Nor was there a single instance in which an overseer did not greet the change with relief when the burden of stock was taken away from him. A mill foreman is essentially a mechanic, with neither inclination nor liking for clerical work. A good foreman sees

all and knows all; this requires concentration, and no man can do justice to this task with some side issue of responsibility.

Modern production control requires a certain amount of clerical work, which must be performed or supervised by the department foreman, and this is all the latter should be responsible for in this connection.

The stock records are kept in the office in charge of a clerk, who if the case warrants may perform other duties. In planning the records, the possible short cuts should be kept in mind. Many well meant and well started control methods have landed in the discard because, during construction, no discrimination was made between essential and non-essential details.

In one mill the new stock control system required the constant attention of two clerks, yet the records were never up-to-date, which almost prompted the disgusted manager to throw the whole thing aside. He decided to ask for outside assistance to revise the system. The method required an entry for every withdrawal no matter how insignificant the article. After revision the requisitions were grouped, and the articles were divided into monthly, weekly and daily groups, and only one entry made where previously thirty or more entries were required. Now the stock records require only half the time of one clerk.

Regarding the stock forms for materials, we must repeat the often made statement that they should be developed to meet the requirements. For odds and ends, and in many instances for the basic raw material itself, the forms illustrated in previous chapters may be utilized, while in other cases a special form should be devised.

In every instance for the control of material stock, four records are essential (not including the requisition or factory order). These forms are as follows:

Stock records for Office Use

Stock Record for Stock Room Use
Identification Tag, Attached to Bale or Case
Daily Report of Raw Materials Given Out

The purpose of the Office Stock Ledger Record is to concentrate in convenient form a control of all stock carried in the stock rooms, and this record should show at a glance all information required by the management and the accounting department for the monthly balance sheet and cost purposes. For each and every grade of material there should be a record showing quantity, origin, identification, date of receipt, value, use and location.

Such a Stock card constructed for the woolen industry is illustrated. (Fom 46.) By rewording the headings it may

Article.....*Ohio ¼*..... Lot No.....*1115*.....

From.....*Deales & Co.*..... Shrinkage.....*33%*.....

Location.....*A #25*..... Marking.....*Δ*.....

Date	Bales	Lbs.	Price	Invoice Cost	Freight	Total Value	Unit Value
9/10/17	*87*	*4294*	*.77*	*3306.38*	*57.30*	*3363.68*	*.7835*

Bale No.	Weight		Given Out				
			Date	Bale No.	Weight	Bal. in Stock	Order No.
81	*114*						
92	*117*	*✓*	*9/15/17*	*83*	*115*	*4294*	*67*
77	*114*	*✓*	*9/15/17*	*73*	*113*		
79	*115*	*✓*	*9/15/17*	*99*	*114*	*3954*	*75*
80	*116*		*10/1/17*	*77*	*114*		
89	*116*		*10/1/17*	*79*	*115*		
87	*113*	*✓*	*10/1/17*	*87*	*113*	*3617*	

Form 46. Stock Record Suitable for Control of Bale or Case Lots

be used for any branch; provided nothing less than bale or case lots are given out of the stock room. These records may be constructed in ledger or card form; the latter is more convenient for the purpose, with one card for every lot, arranged in groups of grades or articles in alphabetical order, and subdivided either according to dates of arrival or in successive lot numbers.

It will be noted that only the perpetual balance is maintained in the record, and of total value and unit value one entry is made when the lot is received. This eliminates the drudgery of extending the totals with every entry; as the control ledger accounts of raw materials show the balance values, the value extension on these records would mean only a duplication of work. A mill manager spending an hour every week with these records will know more about the condition of his stock than by spending hours every day in the stock rooms. Old and forgotten lots, odds and ends will be eliminated.

This form is applicable only in case or bale lots; for mills in which less than full cases or bales are given out at one time another type of record must be provided.

Such a record is illustrated as a silk record. (Form 47.) Here every case or bale is provided with balance space, showing not only what has been used, but what is left in stock. Besides this detailed information, the record shows the total balance in stock. A record for a similar purpose, but especially suitable for the control of yarn used in a winding room, of the cotton and worsted branch is illustrated as Form 47a.

The basic entries for these records come from the original invoices sent to the clerk for entry. The records for goods under transportation should be marked with colored "riders." When the goods are received, the store clerk sends his copy of the receipt to the office, and before it is attached to the

3 LILLY ORGAN 2 THREAD

			Withdrawals							Balance in Stock			
Received *11/1–1917*	Bale No.	*M–717*	Date	*11/17*	*11/21*	*11/22*				*11/1*	*1157*		
From *Tonyo Co.*	Weight	*115*	Taken Out	*25*	*30*	*65*				*11/17*	*1132*		
Value per Lb. *$8.75*			Balance	*95*	*65*	—				*11/21*	*1102*		
Received *11/1–1917*	Bale No.	*M–791*	Date	*11/22*						*11/22*	*1027*		
From *Tonyo Co.*	Weight	*114*	Taken Out	*10*									
Value per Lb. *$8.75*			Balance	*104*									
Received *11/1–1917*	Bale No.	*M–711*	Date										
From *Tonyo Co.*	Weight	*116*	Taken Out										
Value per Lb. *$8.75*													

Form 47. Stock Record Suitable for Control of Stock Given Out in Lots Less Than a Bale. Arranged for the Silk Industry

Mark		Size		Case No.		Location		Opened	
Gross Lbs.		Tare Lbs.		Net Lbs.		Shrinkage Lbs.		Shrinkage %	
Date	Lbs.	Date	Lbs.	Date	Lbs.	Date	Lbs.	Date	Lbs.
Totals									
Total Weight									

Form 47a. Stock Record Suitable for Withdrawing Less Than Bale Lots

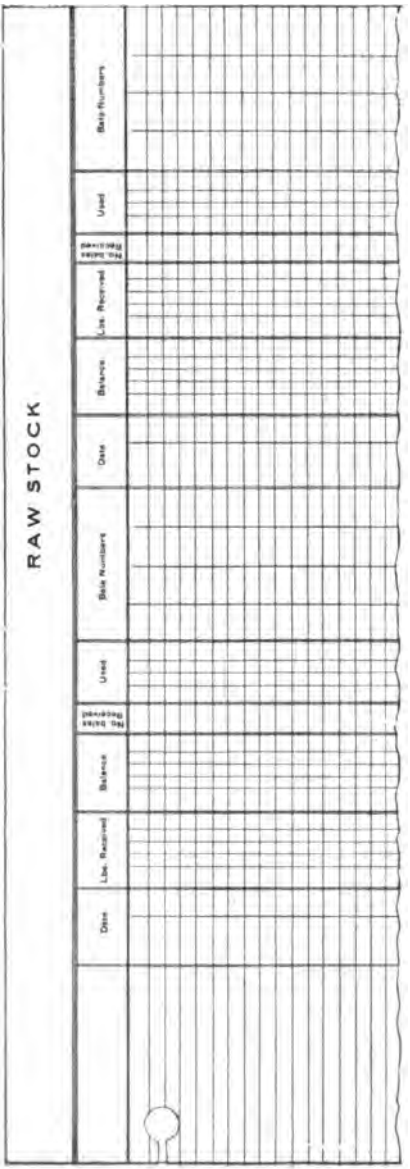
invoice it must have the clerk's signature showing that the receipt has been compared with the entries of the stock card and found correct.

Article *Texas high M X 5* Lot No. *12*
Location *5-7* Received on *11/5-1917*
Bales *115* Lbs. *57,715*

Bale No.	Weight	Given Out	Bale No.	Weight	Given Out	Bale No.	Weight	Given Out
1116	*505*	*11/15*	*1142*	*505*				
1117	*511*		*1143*	*505*	*11/23*			
1118	*492*		*1144*	*507*				
1119	*507*	*11/15*	*1145*	*513*				

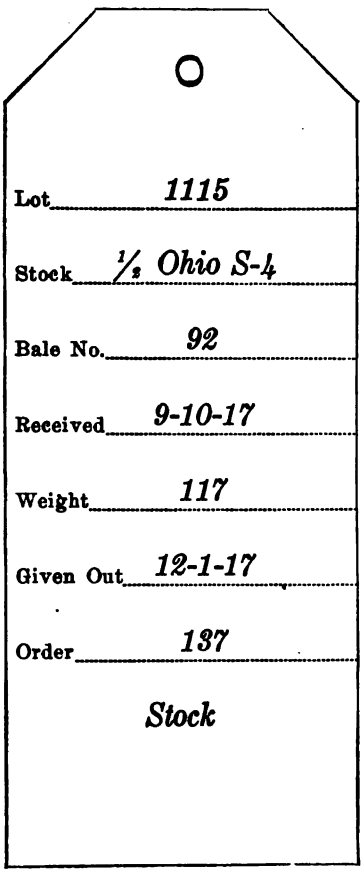
Form 48. Stock Record Suitable for Raw Stock of Wool or Cotton Arranged for Card Index System

The store room must have records to which the storekeeper in charge can refer without running to the office for

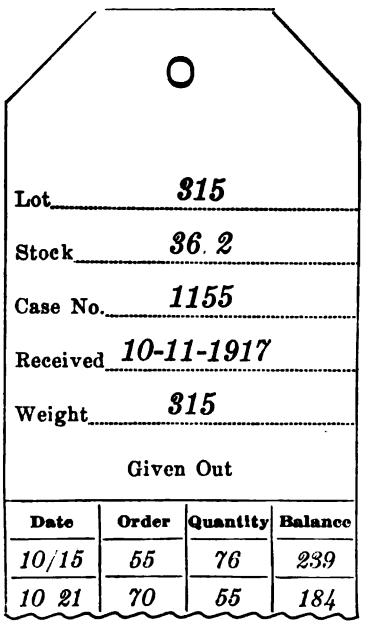


Form 49. Stock Record Suitable for Raw Stock of Wool or Cotton Arranged for Loose Leaf System

information. Such a store record suitable for raw material is illustrated (Forms 48 and 49), the former a card, the latter a loose leaf form. These forms were designed for case and bale lots only. When a lot is received a record is made out as shown. The "Given Out" column is marked with the date when the bale was given out from stock room. When a lot



Form. 50. Identification Tag for Bales or Cases



Form 51. Identification Tag for Bales or Cases, Showing Partial Withdrawals

is finished, the record is sent to the office, and should there be a discrepancy between this and the office record, the office, of course, will investigate. Finally in many mills, especially where high grade imported worsted or cotton yarns are used, it is essential that a dependable record is maintained of the gross, net, tare weight, and shrinkage of the individual cases. A record designed for such purpose is illustrated as Form 49a.

These are the stock records; the next step is the construction of Indentification Tags, to be attached to each bale or case in the store room. For full bale or case lots, illustration (Form 50) is suitable, while for checking partial withdrawals, the tag illustration (Form 51) should be used. The size of the tag depends on its use, and when necessary the reverse side may be utilized. These tags are not thrown away when used, and they form a part of the control. In a large store room it is often desirable to have a separate index kept showing the location of the cases, and such record designed as a card index is illustrated as Form 51a.

The system will need some means to account daily for the various raw materials withdrawn from the store rooms and provide data for the entries of the office records, and give the information needed by the accounting department for cost, control and inventory purposes.

One record for all these would hardly be sufficient. For basic raw materials, the concentrated form "Daily Report of Stock Given Out" is the most desirable, and with the detail construction modified to meet local requirements it will answer for almost every mill. This illustrated (Form 52) form was constructed for a weaving plant. The record provides for the entry of a number of lots, the length of each section depending upon the maximum lot entries of a mill. Most conveniently constructed, the form is five lots wide and two lots long, with ten entries for each lot.

Practice has proved that only very few mills handle in

LOCATION OF CASES

Date.....

Mark	Size	Case No.	Location
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Form 51a. Index of Case Locations Arranged for Card System

a day more than twenty various lots, colors or sizes, and even in an extreme case two sheets would be sufficient for one day's business. In a spinning mill attention has to be paid only to the separation of the grades and lots of raw material, but in a weaving or a knitting plant a separate section in the

Stock given out on *Nov. 11, 1917*

	Grade *40/2 White*			Grade *40/2 Blue*			Grade *36/1*	
	Lot *115*			Lot *197*			Lot *355*	
	Order	Bale No.	Weight	Order	Bale No.	Weight	Order	Bale No.
	115	*33*	*316*	*117*	*315*	*210*	*114*	*003*
	116	*41*	*321*	*109*	*311*	*209*	*137*	*0011*
	121	*116*	*317*				*139*	*004*
	137	*11*	*309*					
	139	*12*	*310*					
	142	*13*	*305*					
Total			*2141*			*419*		
Price	*.6535*			*.8415*			*.5415*	
Value	$		*1399.15*			*352.59*		

Form 52. Section of Daily Report of Stock Given Out

record should be reserved for warp and filling, or other subdivision, if the same lot, grade or color was given out to more than one department.

To prevent mistakes it is well to leave space on the record for marking the department into which the goods were sent. In the illustrated case this was not necessary as all double yarn was for warping and all single yarn was for filling. For convenience, two of these records are fastened in a folder (suitable metal folders can be obtained in stationery stores), and the storekeeper carries this folder along and makes the

entries immediately on the spot where the goods are given out. This limits the possibility of omitting a charge. His own store records are corrected from these sheets any time during the day when no urgent business is on hand, check marking the items entered.

These records reach the office every morning, where they are totaled up, the entries made into the stock records, priced and the values extended, as illustrated. Now the Daily Reports are sent to the accounting department to be utilized for the monthly production and cost entries. The mill manager or superintendent usually inspects these reports every morning for control purposes.

Form for Sundry Materials

For dyes, shipping supplies, boxes and other sundry materials, a suitable form is illustrated (Form 53), constructed for a shipping department. Such materials are most conveniently located near the department, and while the storekeeper is responsible for the condition and use of the stock, the shipper or the person in charge of the department keeps the daily record. This sounds like a contradiction of a previous statement to the effect that no foreman should be burdened with stock control. There is a vast difference between responsibility of storing, ordering and caring for supplies, and the mere action of drawing from the store room. All the former duties are now vested in the storekeeper, who keeps the records with maximum and minimum limits, notifies the purchasing department, receives the goods and takes care of proper storing and good order; while the foreman simply draws on such supplies and enters the withdrawals on his daily record.

These records reach the storekeeper every evening, who, after extending the totals, corrects the store records and forwards the sheets to the office for entries and extensions of

DATE *Nov. 23, 1919*

The following shipping supplies have been taken from shipping store room:

BOXES					BUR-LAP	TWINE		PAPER		NAILS
No. 1	No. 2	No. 3	No. 4	No. 5	YDS.	No. 1 LBS.	No. 2 LBS.	ROLLS LBS.	SHEET LBS.	LBS.
7	2	2		1	62	10	25	35	20	15
3	1									
4										
14	3	2		1	62	10	25	35	20	15
.65	.75	1		1.30	.08	.12	.09	.09	11	.06
9.10	2.25	2.00		1.20	4.96	1.20	2.25	3.15	2.20	.90

Form 53. Daily Report of Sundry Materials for Supplies Given Out During the Day

values. The office does not enter these sundry materials daily, but weekly, or in some articles only monthly. Most conveniently the office clerk in charge prepares an analysis sheet for both quantities and values, a work requiring but a few minutes a day, grouping the articles, and one entry is made at the end of the week.

By changing the size, wordings and divisions of the illustration, similar forms can be constructed for dyeing or finishing departments. For these latter the storekeeper and foreman must co-operate and the purchasing agent should not fail to consult the foreman regarding the use and utility of the various supplies.

Another phase of stock recording that has to be discussed here is stock carried by outside manufacturers, like dyers or throwsters. A record for this purpose is illustrated (Form 54), in this instance for cotton yarn stored at various dyers, with orders less than bale or case lots. The record is constructed for three or more dyer accounts, giving the de-

Dyer	*Hutton & Co.*								Dyer	*Macomber & White*							36/2 Cotton			
																	Son		BALANCE IN STOCK	
Received	*11/13*	Date	*11/15*	*11/27*	*12/5*				Price	Received	*11/13*	Date	*11/16*	*11/18*			*12/1*	Price	*...16*	*5110*
Bale No.	*161*	Taken Out	*80*	*160*	*120*				Per Lb.	Bale No.	*171*	Taken Out	*70*	*70*	*80*		*45*	Per Lb.	*0906*	*5070*
Lbs.	*810*	Balance	*280*	*120*	—				67½	Lbs.	*507*	Balance	*237*	*167*	*147*		—	67½	*0130*	
From	*N. E. C.*	Lot No.	*115*	*196*	*211*					From	*C to C*	Lot No.	*131*	*157*	*148*		*121*		*3005*	
Received	*11/13*	Date	*12/5*	*12/10*	*12/12*	*12/18*	*12/21*		Price	Received	*11/13*	Date	*12/5*	*12/10*	*12/13*			Price	*5970*	
Bale No.	*162*	Taken Out	*80*	*81*	*69*	*110*	*75*		Per Lb.	Bale No.	*172*	Taken Out	*50*	*110*	*80*			Per Lb.	*5890*	

Form 54. Record of Stock at Dyers or Other Outside Converters

tails of disposition of each bale, including the balance left of the opened bales, together with a perpetual balance, showing how much material is in stock at all the various dyers.

Those who have had occasion to handle yarn accounts with various dyers in less than bale lots will readily recognize the advantages of this method. Of course, this record will not eliminate the dyer's ledger, which again can be combined with the order book, the original going to the dyer and the duplicate filed to serve the purpose of the former. For converting purposes, and instances in which nothing less than case or bale lots are ordered, this arrangement will not do, and a regular store record as illustrated in Form 48 or 49 will answer for the purpose. For the silk branch of the industry, such a record must be materially rearranged and space provided for details of throwing, gains and losses, and in the case of the silk dyeing record, for the various loadings and other details.

This finishes the discussion of stock records for supplies and raw materials. The successful execution of control will depend entirely on the care the management exercises and the suitability of the forms for the requirements of the mill. No doubt many perplexing questions and annoying details will arise, with even a trend of hostility from individual employes. But what are these handicaps compared with the gain of well organized and controlled stores?

The purchasing department and the storekeeper must work hand in hand, and it is not a bad plan to give the purchasing agent full charge of the whole stock organization. The physical arrangements and handling of stock should not be left to whim and fancy. Cleanliness and order are the first requisites. The writer, who in his professional work has visited many plants, can unfailingly judge by the physical appearance of the store rooms of the care with which materials

are handled. Men with similar experience will readily confirm this statement.

With nine-cent cotton, forty-cent wool and four-cent castings, wasteful stock keeping was considered wrong; how about today with the high cost of materials? The superintendent who passes, without remark, the broken quill on the floor or the handful of spilled wool, may be sure that this waste will be multiplied many times when he is not present, because even with constant vigilance and all the ingenious methods of control, we have constantly to fight the thoughtless and wasteful nature of the human element.

The location of the storerooms has an immense influence on the handling of the stock. Stock rooms should be whitewashed, airy and light, should be swept and cleaned as frequently as the office, and the materials received should be placed upon the proper shelves immediately. It is no exaggeration to say that in mills where supplies are left to take care of themselves, the value is decreased ten per cent before they reach their final destination.

A stock room without isolation and control, which naturally means disarranged and neglected stock, is the favored place of congregation for the idle and the shirker, of which every mill has a certain percentage. The writer has seen this element break off the heads of a dozen spools of tape, just for an idle pastime, or cut new shuttles into chips to test the blade of a knife. The only protection of a mill is control, order and responsibility.

The selection of a storekeeper is a very important question. He must be familiar with the general processes of the mill and have some knowledge of the materials. He must have sufficient intelligence and clerical experience to take care of his records, and first and foremost should be clean and neat. Personal appearance should be a fair indicator of habits, and no one but an extremely neat person is fit for the store-

keeper's job. Nor should he generally be too large and heavy. The job requires activity, better suited for the wiry man than for the heavy individual.

Storekeeping should have standard rules and regulations, and such standard instructions should be carefully devised by the management and given to the persons concerned with them. These rules should take up in detail the receiving, storing, handling, giving out and recording of the stores, and the definite responsibilities.

This finishes the discussion of purchases, stores and control of materials. The organization is no doubt tedious work, but to insure proper control it is essential. Mill managers more and more come to realize the importance of modern control methods, and those who have taken the trouble to introduce them have found them to be a good business proposition.

CHAPTER XIV

THE CONTROL RECORDS OF GOODS IN PROCESS

The stumbling block of the average cost and production control method is usually in the control of materials in process and the relation of the quantity of these materials to the orders. The whole system is useless unless it is able to assist in sending orders through the processes and insure the anticipated deliveries. This again involves the preparation of raw materials, prevention of shortages, delays and other production frictions that are the dread of the management. At the same time ways and means have to be provided for the control of cost and the channel provided for the cost data to reach its final destination, the control accounts.

For some branches of the textile industry such control is simple while for others it is difficult. The selfsame method cannot be employed for every branch, so it will be necessary to take up the problem for the various branches individually.

The control of woolen manufacturing is the most difficult in the textile industries. The lot of a woolen manufacturer is not an easy one. One or two grades of wool may form the basic raw materials; these may be split into a dozen or more sortings, each with varying shrinkages; the scourings may be blended, producing another set of units, with proportions of colored stock. The control of production and cost in such a case needs the utmost patience and the system may look burdensome, but because of the complicated processes of this branch of the industry extensive methods are preferable to the

uncertainty of a mere guess, or what is worse, a crude method of cost control.

For cost control purposes a woolen mill has to be divided into sections comprising the four stages of manufacturing as follows:

First—sorting, scouring, dyeing.
Second—from picking to the finished yarn.
Third—spooling, winding, beaming, weaving.
Fourth—the finishing processes.

For an example we will take a woolen mill with all the above processes, manufacturing fancy overcoatings from wool of various shrinkages, with complicated blend mixtures; in other words we will assume the most unfavorable and most difficult conditions from the point of a cost control organization. Mills of other branches will not find it difficult to alter the control methods to suit their purposes.

The same Order Register and Blend Register which has been fully discussed as the means of control for the raw material purchases will also serve as the records yielding information for our present purpose.

Let us repeat the original illustration applying it to the present problem: The wool used by the mill sorts into

Fine Sorting 23% with shrinkage of 33%
Medium Sorting 60% with shrinkage of 33%
Coarse Sorting 15% with shrinkage of 60%
Strings, loss, etc., 2%

The Blend Register referred to above has been constructed to supply the basic information not only for the purchases of the mill, but for manufacturing as well. How shall we use it for manufacturing control purposes?

Every mill must have some record to show the sorting and scouring requirements of the plant, also the cost of the

various sortings, and every mill has some records, but usually in such loose or undependable form that at best they furnish information only for the moment. Our task is, therefore, to regulate such control inefficiencies and let one source of information serve as many purposes as necessary; reduce clerical labor to the minimum and keep away from red tape. It should also be borne in mind that even with the greatest care of organizations, scientific control methods require clerical labor of care and intelligence.

At present we will take up sorting, scouring and dyeing, and the task is to supply the manager with the following information:

Sortings required to cover the orders.
Sortings made to cover these requirements.
Sortings in stock.
*Labor cost of the various sortings.
*Burden cost of the various sortings.
*Total cost of the various sortings.
Monthly scourings of the various sortings.
Total scourings of the various sortings.
Shrinkage of scourings.
*Labor cost of scourings.
*Burden cost of scourings.
*Total cost of scourings.
Scoured wool used of the various sortings.
Stock dyed of all sortings and colors.
Cost of dyed stock, separated as to
*Dyes, chemicals, labor and burden.

The most desirable procedure in this case is the construction of a Sorting and Scouring Ledger (Form 55), which will furnish all information for each grade of sorting. The Blend Register is closed weekly, so all information referring

* The increase or decrease of any cost factor must be shown in the records.

SORTING AND SCOURING LEDGER

Grade *Medium 0¼*

Requirements			Sorted			Balance on Hand	Given Out			Cost @	Cost of Sorting						
Date	Orders	Total	Date	Lbs.	Total		Date	Lbs.	Total Lbs.		Total	Totals	Labor	Labor Total	Burden	Burden Total	Total Value
5-14	10719	10719	5-20	1450	1450	1450				.67	971.50		7.25				
5-21	2165	12884	5-27	650	2100	2100				.67	435.50		3.25				
			5-28	1200	3300	3300				.67	804.00		6.00				
5-29	9150	22034				1300	5-28	2000	2000								
						300	5-30	1000	3000								
			5-30	1050	4350	1350				.67	703.50		5.25				
		22034			4350	1350			3000			2914.50		21.75	45%	9.79	2946.04
6-6	1700	23734	6-4	2100	6450	3500	6-10	2000	5000	.67	1407	1407.00	10.50	10.50	51%	5.36	
6-13	2900	26634					6-13	1000	6000								
6-27	450	27084					6-21	1000	7000								
		27084			6450	3500			7000	.67		1407.00		10.50	51%	5.36	1422.86

Form 55. A Page of the Sorting and Scouring Ledger

Sorted Stock *High Limit 4000, Low Limit 1500* Scoured Stock *High Limit 2000, Low Limit 1500*

Value of Sorting Before Scouring				Cost of Scouring				Total Value	Shrinkage		Scoured Weight	Cost Per Lb.	Scoured Balance on Hand	Given Out		Order No.
Per Lb.	Lbs.	Lbs. Total	Value Total	Labor	Labor Total	Burden	Burden Total		%	Lbs.				Date	Lbs.	
	2000	2000		2.40					33%	660	1340		1340	5-28	800	17
	1000	3000		1.20					33%	330	670		1240			
.6775													1910			
.6775		3000	2031.20		3.60	110%	3.96	2039.16	33%	990	2100	.9714	1910		800	
.6795	2000	2000		2.75					33%	660	1340		3250	6-11	1500	19-21
	1000	3000		1.30					33%	330	670		1750			
	1000	4000		1.10					33%	330	670		2420	6-17	1000	33
													1420			
													2000	6-20	500	38
													1500			
.6795	4000	4000	2718.00		5.15	110%	5.67	2723.82	33%	1320	2680	.9824	1500		3000	

Form 55. A Page of the Sorting and Scouring Ledger —(Continued)

to the sorting requirements will be entered at the same time into this ledger, under the heading "Requirements," for each and every sorting. This column has "date," "orders" and "total" sections; it will, therefore, show the weekly and total orders.

The next step is the registry of the sortings, and at the same time some means must be provided to regulate the production of the department. The high and low limits of stock, or the maximum and minimum employed in ordering materials, answers excellently for this purpose, too. It is the manager's task to establish from time to time, depending on the orders, high and low limits for all sortings and scourings to be kept on hand, and then the department heads can themselves decide, judging from the stocks on hand, what to sort and what to scour. If these limits are once established, the system works automatically without burdening the management with details. The ledgers, of course, show the balances on hand and it is a good plan to supply the foremen weekly with a list of the book balances and correct any discrepancies. These book balances and the stock will, of course, never tally exactly, but should the difference be above five per cent either way it will be advisable for the management to look into it carefully, as such differences are caused either through careless weighing or higher or lower shrinkages than the estimated, both of which causes are sufficient to wipe out the profit of the business. In every well arranged mill, bins holding a definite quantity are provided for the wool, so checking of the accounts is quite simple.

The foreman of the sorting department, thus supplied with information as to high and low limits of stock, prepares a Daily Sorting Report (Form 56) of the production of the department for the office. This report is spaced for the names of the sorters, quantities of the various sortings, and at the extreme right spaces are left for the total daily sorting and

the earnings of the sorters. The width of the record depends upon the number of sortings possible, as for each sorting grade a separate column must be provided. The length of the form is regulated by the number of sorters employed in the mill. At the bottom of the record space has been provided for totaling the various sortings, also for the total labor cost of each sorting.

SORTING REPORT

August 7, 1919

Sorter	Sortings in Lbs.						Total	Earnings
	Fine 1	Fine 2	Medium	Medium B	Coarse	Skirting		
Wm. Feland	*115*		*210*		*75*	*10*	*410*	*2.66*
Fred Lanise		*97*	*310*		*61*	*5*	*473*	*3.10*
Geo. Wright	*97*		*230*		*75*	*7*	*457*	*2.98*
Robert Stearn	*31*			*75*	*10*	*2*	*119*	*.63*
Totals	*320*	*210*	*2115*	*75*	*598*	*115*	*3027*	*19.70*
Labor Cost	*4.11*	*1.06*	*10.58*	*.38*	*2.97*	*.58*		

Form 56. Daily Sorting Report

For entries, the following procedure should be employed: In a previous chapter stock-control records and tags were described and no unsorted bale should be without a tag. When a bale is given to the sorter, his name is noted on the tag and the stockroom record credited with the bale. At the end of the day, all tags are sent to the office to correct the wool stock records. Once a day each sorter's work is examined by the foreman, the sortings weighed and at the same time, when the sorter is credited in his pay book or record, the same data is recorded on the Daily Sorting Report. Should this entry be made twice a day, two columns are provided for each sorter. At the end of the day, the record is sent to the office; first, to

the payroll clerk, who credits the sorter's account, then to the clerk intrusted with the factory records, who extends the labor cost for each sorting and makes his entries into the Sorting and Scouring Ledger for each sorting.

The second heading of the Sorting and Scouring Ledger is marked "Sorted." Here the quantity sorted for the day is entered and the total extended to show the total quantity sorted; which again, if compared with the total of the requirements, affords a perfect control for the management. At the same time "Balance on Hand" is corrected, together with the entry of the value of the wool and the labor charges, in their respective columns. It is up to the management to furnish the information as to the values of the sortings.

The burden or overhead charges of the department are determined at the end of each month in a manner to be explained under the discussion of burden control and distribution. Burden is expressed in its relation to direct labor, and in this case it has been assumed to be 45 per cent. At the end of the month, therefore, the labor charges accumulated are totaled up and the burden percentage of this total entered into the "Burden Total" column.

When all factors of cost at the end of each month are thus obtained, the total cost of each sorting is known and the "Value per Pound" entered.

For the scouring process the procedure is similar, but this record has been constructed for a flat rate of labor instead of piece work. The scouring boss is supplied with a Daily Scouring Report (Form 57), the length of which depends on the number of sortings scoured a day, while for each sorting three lines are provided. Horizontally the record is divided into "Grease Weight," "Shrinkage," "Scoured Weight," "Starting" and "Finishing Time," the "Number of Hours," and finally the "Labor Cost."

Under the proper division of the sortings, the foreman

SCOURING REPORT

August 7, 1917

Sorting	Grease Weight	Shrinkage	Scoured Weight	Started	Finished	Hrs.	Labor Cost
Medium	*1000*	*33%*	*670*	*7.00 AM*	*9.15 AM*	*2¼*	*.90*
	500	*33%*	*335*	*3.00 PM*	*4.30 PM*	*1½*	*.60*
Total	*1500*		*1005*			*3¾*	*1.50*
Coarse	*500*	*60%*	*200*	*9.15 AM*	*11.15 AM*	*2*	*.80*

Labor	Hrs.	@	Total	Machine		To-tal	Scouring Materials
				Broke Down	Idle		
A. Pasteonan	*10½*	*.20*	*2.10*	*3 to 3.40*		*40*	*115 lbs.*
N. Figlio	*10½*	*.20*	*2.10*				
	21		*4.20*	Chg. to burden *.30*		*40*	

Form 57. Daily Scouring Report

enters the quantity, also starting and finishing time. On the bottom of the record, space has been provided for labor entries. Before sending the record to the office, the foreman enters here the names of the workers and the total hours each was engaged in the scouring process, also notes referring to idle or broken machinery and the scouring materials used.

In the office, the "Shrinkage," "Scoured Weight," "Hours for Each Lot," "Cost of Labor" are extended. After the pay clerk has made his entries, the ledger clerk completes his sort-

ing and scouring records from this data. The totals of "Grease Weight" are entered for each sorting under the "Given Out" section of the Sorting and Scouring Ledger, the "Balance on Hand" corrected, and the same amount with total entered into "Value of Sorting Before Scouring." The cost per unit of this item is, of course, the total unit cost of the sorting, while for the "Cost of Scouring" the labor cost is to be found in the last column of the Daily Scouring Report.

The shrinkage and scoured weight is put into the proper section of the ledger, and the "Scoured Balance on Hand" extended. The last column of the ledger provides for the data of "Scoured Stock Given Out."

At the end of the month, the burden is determined as described above, and the accounts for each sorting are closed. The labor charge for idle or broken down machinery is carried to the burden account and the report finds its way to the desk of the manager, who in one minute of inspection is able to form a good opinion as to the run of the department.

The Sorting and Scouring Ledger is now closed, the results of the month entered with red ink, and some responsible member of the management inspects it. Now let us see what such a record will tell. It will give the following information:

Requirements of the Sorting. Orders received during the month for the sorting and the total requirements for the season of this work.

Sorted Stock. Stock sorted during the month, also during the whole season.

Balance on Hand. The balance of sorted stock on hand.

Given Out. The sorting given out to scouring during the month, also the total during the season.

Cost of Sorting. The cost of the sorting, the total labor, the burden, the total cost of sorted wool, and the cost per pound of the sorted wool for the month.

Value of Sorting Before Scouring. The value of sortings taken out during the month.

Cost of Scouring. The value of the scoured wool, the total labor and burden for the scoured sorting during the month.

Shrinkage. Shrinkage in percentage and in pounds for the sorting scoured during the month.

Scoured Weight. The net weight of the scoured sorting.

Cost per Pound. The value and cost per pound of the scoured sorting.

Scoured Balance on Hand. The scoured sorting on hand at the end of the month.

Given Out. The total scoured sorting used during the month.

With such a record in the hands of the manager once a month, there is very little possibility of shortages, excessive shrinkages, careless weighing and undue increase of cost. Any detrimental factor can be nipped in the bud, attention directed to the source and the remedy applied.

A few more words about the clerical labor involved. If proper instructions are followed, the work is not burdensome or difficult. Even in large mills there are rarely more than a dozen active accounts a day, and after a little experience an average clerk can master the work, with hardly more labor than for an ordinary purposeless record.

The daily reports are simple, requiring little work, are free from red tape, and combine at the same time the payroll control. These records being inspected daily by the manage-

DYEING REPORT

August 7, 1917

Grade	Lbs.	Color	Dyes Used	@	Total	Chemicals Used	@	Total	Labor Hrs.	@	Total
		#77	20 Lbs. Fustic	.20	2.00	40 Lbs. Mt.	.07	2.80	6½	.211	1.38
Medium	500	Black									

LABOR LIST

Name	Rate	Hrs.	Earnings		
John Taylor	25	10½	2.63	Total Labor Hrs.	40
Edw. Brown	20	10½	2.10	Total Earnings	8.44
Wm. Blue	25	8½	2.13	Cost of Labor per Hr.	.2110
Fred Indigo	15	10½	1.58		

Form 58. Daily Dyeing Report

ment, leave but meagre promise of success for dishonest intentions.

The illustration of the ledger has been, of course, concentrated to save space, but is extended for two months to show the working details.

The only remaining problem to be discussed in this section is the handling of dyed stock. This method is suitable for wool or cotton or yarn stock as well. For this purpose, a Daily Dyeing Report (Form 58) is constructed, with spaces for "Grade," "Pounds," "Color," "Dyes Used" and "Chemicals Used," "Total Cost of Dyeing Materials," "Hours of Labor" and "Total Cost of Labor." The dyer has to fill out for each lot the grade, pounds, color, dyes and chemicals used, and the labor hours. At the end of each day he enters on the bottom of the record the names and hours of each employe of his department.

The record is first sent to the stock ledger clerk, who extends the values of the dyes and chemicals, credits the stock records, and sends the report to the payroll clerk who credits the workers with their time, marking the rate and the total earnings of each on the report. He also marks the total labor hours, total earnings, and cost of labor per hour.

Similarly to the Sorting and Scouring Ledger, a Dyed Stock Ledger (Form 59) is constructed for each grade and color. From the Daily Dyeing Report each item for this ledger is secured with the exception of "Given Out" stock and the cost of scoured wool. The latter item is obtainable from the proper page of the Sorting and Scouring Ledger. The procedure of entries is similar to that for the Sorting and Scouring Ledger, and at the end of the month the accounts are closed, supplying for each grade and color the following information:

Dyed. Stock and color dyed during the month, also during the season.

DYED STOCK LEDGER

Grade *Medium* Color *Blk. #77* High Stock *1000* Low Stock *200*

Dyed			Value of Wool			Cost of Dyeing								Dyed Cost		Balance in Stock	Given Out		
Date	Lbs.	Total	@	Total	Totals	Dyes	Dyes Total	Chem.	Chem. Total	Labor	Labor Total	Burden	Burden Total	Total	Per Lb.		Date	Lbs.	Order
10/7	500	500	.9824	491.20		2.00		2.80		1.58						500	10/10	200	67
																300	10/15	150	72
																150			
10/17	500	1000	.9824	491.20		2.00		3.10		1.56						650			
																350	10/21	300	91
10/27	1000	2000	.9824	982.40	1964.80	4.30	8.30	7.10	13.00	4.05	6.99	145%	10.15			1350			
																650	10/28	700	99
	2000	2000	.9824		1964.80		8.30		13.00		6.99		10.15	2003.24	1.003	650		1350	
																350	11/9	300	105
11/13	500	2500	.9975	498.75		3.10		3.45		1.45						850	11/21	600	127
																250			
11/25	500	3000	.9975	498.75	997.50	3.10	6.10	3.15	6.60	1.25	2.70	150%	4.05			750			
	1000	3000	.9975		997.50		6.10		6.60		2.70		4.05	1016.95	1.017	750		900	

Form 59. A Page of the Dyed Stock Record

Value of Stock. The total value of the scoured wool for the month used for dyeing.

Cost of Dyeing. The cost of dyes, chemicals, labor and burden for each color, sorting or mixture during the month.

Dyed Cost. The dyed cost for each grade and color for the month in total and unit cost per pound.

Balance in Stock. The balance of each dyed stock on hand at the end of the month.

Given Out. The total stock given out for batches during the month.

CHAPTER XV

THE CONSTRUCTION OF PRODUCTION RECORDS

I have before me a collection of the production records of two large manufacturing organizations. One is a cotton yarn mill and the other a cotton weaving and finishing plant. Both organizations grew from a small beginning; their control records were developed at random until the system became too complicated to handle and had to be revised.

Of the yarn mill, while the collection is incomplete, there were forty forms and records connected with production control. They are of all sizes and shapes, designed to cover almost every activity of the plant; but since they did not provide accumulative records there is not a single record in the collection that gives permanent and constructive information for cost and control purposes.

The weaving and finishing plant referred to had a collection of forty-seven production records of all sizes, shapes and purposes as a result of their unsystematic control methods. Many of the records contain information so incomplete that it has no practical use, and in fact, are never inspected by the mill officials. The reproduction of these records would be excellent as an object lesson to show how production and control records of a plant should NOT be planned and designed, but as this would be unethical we will have to be satisfied with a description of their main faults.

A record must yield information of permanent value in definite terms. It should yield dependable data for cost cal-

culation and for the control accounts, besides reflecting the prevailing conditions on production, labor, waste and other factors. One record should serve as many purposes as practicable. The size of the records should be limited to standard sizes with as few variations as can be conveniently arranged. No record has a permanent value unless it can be referred to in the future without loss of time.

There are four standard sizes of paper or cardboard, any one of which is suitable for control records, either in loose leaf or in card index form. These sizes are:

3 " x 5"	5 " x 8"
4 " x 6"	8½" x 11"

Exceptions are analytical or accumulative control records—which are purely for office use. Even for such records there are standard ledger sizes, the multiples of the above sizes, that are suitable for the purpose.

Of the spinning plant mentioned above, of twenty-eight records, twenty-four were of different sizes.

3¼" x 7¼" 1 record	5½" x 12⅞" 1 record
3 " x 5 " 3 records	5¾" x 8¼" 1 record
4¼" x 2½" 1 record	5¾" x 10⅛" 1 record
4¼" x 5⅝" 1 record	5¾" x 11¾" 1 record
4½" x 5¼" 1 record	5⅞" x 8 " 1 record
4½" x 6 " 1 record	6 " x 9½" 1 record
4½" x 6¼" 1 record	7½" x 7 " 1 record
4½" x 6½" 1 record	8½" x 12½" 1 record
4½" x 7⅛" 1 record	8¾" x 10½" 1 record
5 " x 8 " 2 records	10 " x 8¼" 1 record
5½" x 7 " 1 record	10½" x 8 " 1 record
5½" x 8½" 1 record	14 " x 17 " 1 record

With such a collection of sizes, proper maintenance and filing of records was out of the question and they were littered

all over the office and the overseers' desks, in cabinets and every nook and corner. They were in such shape that no reference could be made to them without a great loss of time and as a result many records were missing.

The method of designing the records was just as haphazard and there were many duplications of records, one having just a trifle different information than the other. This mill had three different kinds of production order records, each having just a trifle different information than the other and they were kept by three different clerks. If complete information was needed for an order it was necessary to go to three different departments when one clerk could have just as conveniently carried the information on one record.

The mill had an Employes Reference Record, an Employes Wage Card and an Employes Discharge Card; each of a different nature. All this information could have been conveniently incorporated into one properly constructed record. There were two differently constructed payroll records, one for the spinning department and the other for the rest of the plant, when one record would have served the purpose. The weekly production records from the departments were all of different size and the Superintendent had to keep six files for them. Many of the records were only half utilized and the information not used. For instance, the Production Record of the spinning and carding department showed the total production, but did not show what was produced on the various orders, and the office had no way of telling how orders were progressing. The spinning Production Record carried the information of the bands and oil used during the day, but this was not transferred to a collected record that would have given information of value as to bands and oil used in a month.

In spite of the formidable array of records the mill did not possess dependable information as to correct manufacturing cost and the best they had was estimates based on averages.

During the past few years the constant increase of the cost of raw material and the exceptional demand for textile products made such practices tolerable, but it is more than certain that in the future, mills possessing such systems of production control will find themselves at a great disadvantage over mills having a scientifically developed cost control system.

Method of Determining the Record Requirements of a Mill

The control accounts of a cost system should serve as a basis for determining what kind of records are needed and how to develop them. To determine what information and in what form it will be needed from the manufacturing departments to yield the information for the credits and charges of the control accounts analyze the table of accounts (Illustration 28). By following this procedure no mistakes will be made in designing the records.

For illustration, we will follow the above method using the table of accounts as an index and designing the Production Records of a cotton spinning plant.

The Production Records will have to reflect the changes regarding

a Material
b Supplies
c Waste
d Labor
e Production

a. Material

According to the table of accounts the charges for materials are made through the Monthly Charge Sheet (Form 20) taken from the Vouchers (Form 18). For this purpose no more records are necessary.

For the maintenance of Stock Records (Forms 46, 48,

50) are suitable after being arranged in detail for the cotton industry.

The weighing and sampling records are standard documents known to every manufacturer and need not be illustrated.

Credits are made through the Monthly Credit Sheet of Materials (Form 23), but besides this record another will have to be provided to supply the information to this monthly credit sheet of materials, which in this instance will represent the material sent to the opening room and can be utilized at the same time as the production record.

b. Supplies

Charges are made through the Monthly Charge and Credit Sheet (Form 24) which completes this transaction.

Credits are made through the same medium, the information for which is supplied by the Requisition Record (Form 30), handled as explained in the chapter referring to Supply Control. The illustrations in this chapter provide full information referring to Supply Ledger, Stock Records and Identification Tags. Special provision will have to be made for supplies of power, the control of which is not incorporated among the other supplies and also for machine shop supplies used for repair job and construction work. For these two items the Requisition Form (Form 30) will not do,—a special record will have to be designed for each purpose.

The Power House Record should be a daily record showing the consumption of coal, oil, and water; the power generated; the readings of the various indicators, such as steam, electric current, etc., ash production; coal tests, etc. In this one record there will be incorporated all information essential for the upkeep of such records, the charging for the control accounts and the maintenance of the humidity record of the management.

The Machine Shop Record should be arranged according

to jobs, showing the materials used, labor expended, value of both, and finally, the department identification. This record will have to go first to the Stock Ledger to correct the balances for the material withdrawn, then the cost of the job, labor and material calculated and the totals recorded on an accumulative record which will serve a double purpose. It will yield the monthly burden for the various departments for repairs and provide the management with dependable information referring to the upkeep of the department and the cost of such upkeep.

c. Waste

Charges for this account are made from the Monthly Waste Report for which record (Form 25) can serve as an illustration; but besides this, a Daily Record will have to be designed showing the waste production of the various departments and serving as a preliminary basis for the above record and also for manufacturing control purposes. This will necessitate a Daily Record which in many departments can be combined with the Production Record. An accumulative record is also necessary to form a basis for the monthly total information.

Sales of waste is a selling transaction and the Charge Order can be utilized very well for the purpose.

d. Labor

Under this caption all kinds of labor are considered, such as productive labor, non-productive labor, wages, and salaries. The charges and credits for this account are obtained from the Monthly Payroll Distribution Sheet (Form 27) which is a recapitulation of the Payroll Sheets (Form 26). Further records will have to be provided showing the accumulation of time or earnings for each employe. For piece workers and workers compensated by the hour on productive work the quantity of production is also shown on the record, provided with

identification numbers referring to order or lot. For employes classified as non-productive laborers, wage earners or salaried employes time clock records or the Time Book will have to be provided in which the hours at work are shown daily. These records arranged according to the above requirements will serve equally well for payroll accumulation, cost accumulation and management control. Of course, we will have to provide a Manufacturing Production Order to authorize production and test records which can be incorporated with the records on labor and production.

e. Production

Besides the above records, certain accumulative records called Summaries will have to be provided for cost record maintenance and for administrative purposes.

This is about all the primary records that are essential for the control of cotton spinning and the task now is to combine into one record all the information that can be safely and efficiently carried on one document.

For this purpose begin with the manufacturing operations and analyze each department as to how records may be combined and how to proceed in collecting the information. This can be done in the following manner:

Material

All manufacturing records referring to material go to
Stock Ledger
Manufacturing Cost Records
Management
Control Accounts

Waste

All manufacturing records referring to waste go to
Stock Ledger
Manufacturing Cost Records

Management
Control Accounts

Power and Repair

All manufacturing power and repair records go to

Stock Ledger
Management
Control Accounts

Earnings

All manufacturing records referring to Earnings go to

Payroll
Manufacturing Cost Records
Management
Control Accounts

Endeavor to incorporate into one record all information that will be dispatched to the same stations. Records should be constructed in the order in which the information must travel and at each station the information referring to that station should be extracted from the record and then sent on to the next. This means that the designing of a Production Record must proceed according to a definite plan which is not a personal choice but a necessity to assure the best results. To give an actual illustration, let us consider the construction of a record in the opening department. This is a daily record and it is possible to incorporate into it the information referring to all the activities of the department.

According to the schedule prepared above, the stations for information are

Material
Waste
Earnings

and regarding Material the information must travel in the order of

Stock Ledger
Manufacturing Cost Records
Management
Control Accounts

and for Waste the

Stock Ledger
Manufacturing Cost Records
Management
Control Accounts

and for Earnings the

Payroll
Manufacturing Cost Records
Management
Control Accounts

Therefore, the construction of these records as illustrated in Form 60 will proceed in the same order.

The first information refers to Material. This is arranged for by four lot or order numbers which are about the maximum for the average mill a day and detailed information for bale number and weight. Provisions are also made to show the total pounds and the value of the cotton for each lot.

The second information refers to waste, giving the quantity and space provided for unit cost and total value for each lot or order number.

The third information refers to productive labor, giving the employes hourly rate and total earnings.

The fourth information is general management information giving total productive labor cost, productive labor cost per pound and total pounds produced.

The routine of this record will be in accordance with the above schedule as follows:

Date.....

DAILY OPENING ROOM REPORT

Lot or Order No.		Lot or Order No.		Lot or Order No.		Lot or Order No.	
Bale No.	Weight	Bale No.	Weight	Bale No.	Weight	Bale No.	Weight
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
Total lbs.....		Total lbs.....		Total lbs.....		Total lbs.....	
@.....=$.....		@.....=$.....		@.....=$.....		@.....=$.....	
Bagging, Ties, Waste.....lbs. @.....=$.....		Bagging, Ties, Waste.....lbs. @.....=$.....		Bagging, Ties, Waste.....lbs. @.....=$.....		Bagging, Ties, Waste.....lbs. @.....=$.....	
Productive Labor Cost @.....per lb.=$.....		Productive Labor Cost @.....per lb.=$.....		Productive Labor Cost @.....per lb.=$.....		Productive Labor Cost @.....per lb.=$.....	

PRODUCTIVE LABOR

Em-ployes	Rate Per Hour	Hours Worked	Total Earn-ings	Em-ployes	Rate Per Hour	Hours Worked	Total Earn-ings
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....

Total Productive Labor Cost $..... Productive Labor Cost per lb....
Total lbs. Produced.....

Form 60. Daily Opening Room Report for the Cotton Spinning Branch

Opening Routine

The foreman usually receives from the picker room, the information as to what cotton is needed, for which order and in what quantity. This is recorded as the bales are received from the storehouse into the proper section.

At the end of the day the foreman fills out in the proper columns the burlap and waste produced for each lot per order, the employes' names and their hours worked during the day, and then sends the record to the Clerk keeping the Stock Ledgers.

Stock Ledgers

The Stock Ledger Clerk checks the bales from these records in his ledger and totals the columns for each lot or order number, adds the average price per pound and the total value of cotton used for each lot or order number. He will at the same time credit the waste account with burlap waste and add to the record the value of this waste per pound and the total value for each lot or order number, and the record is sent to the next station.

Payroll

The Payroll Clerk adds the rate for each employe, extends the total earnings, and then records the hours and earnings for the day in the weekly accumulative payroll and forwards the record to the next station, which is

Manufacturing Cost Record

Manufacturing Cost Records are of two kinds,
Accumulative (Form 61)
Summary (Form 62)

Accumulative Manufacturing Records are maintained for each lot or order and the information on these records is regis-

tered under the proper heading. The Daily Opening Room Report will supply information for each lot as to the raw materials used, which is copied in detail from the report, together with unit cost and total cost.

The burlap waste information is recorded in the proper column under the Waste section of this cost record and finally the productive labor cost is obtained from the same record and registered under Opening and Picking Labor in the Cost of Productive Labor section. All information referring to Manufacturing Costs having been extracted, the record is ready for the next station.

Management

The Management is interested only in summary information, which is total productive labor cost, productive labor cost per pound and total pounds produced. This latter information is given on the bottom of the report and will serve as an entry for the summary sent to the Manager. The record is now ready for its last station, which is the Control Account.

Control Account

In the Accounting Department these records are filed until the end of the month when an analysis is made of the material contained therein for the Monthly Credit Sheet for material and waste respectively.

The above concludes the illustrations of the principles of scientific record construction, demonstrating that an efficient and truly serviceable record cannot be constructed on a hit-and-miss method. For each record there is a definite purpose and it has to travel in a definite channel and for its absolute success this rule must be obeyed.

MANUFACTURING COST RECORD

Size.....
Twist.....
Grade.....

Lot Number

Stock.....
Mark.....
Customer.....

| DATE | RAW MATERIAL | | | | WASTE | | | |

Continued from previous page.

| | Net Cost of Material | | |

COST SUMMARY

Yarn.....

Color No.....

Date	Standard Cost							
Batch No.								
Weight of Batch								
Unit Value of Batch								
Total Value of Batch								
Total Waste Lbs.								
Total Waste %								
Total Value of Waste								
Unit Value of Waste								
Shrinkage %								
Cost of Emulsion								
Total Net Cost of Batch								
Net Cost of Batch per Lb.								
Total Picking and Carding Productive Labor								
Picking, Carding Productive Labor per Lb.								
Total Spinning Productive Labor								
Spinning Productive Labor per Lb.								
Total Productive Labor per Lb.								
Total Department Burden								
Total General Burden								
Department General Burden per Lb.								
Total Manufacturing Cost per Lb.								

Form 62. Summary Manufacturing Cost Control, Arranged for Woolen Spinning Produce

CHAPTER XVI

PRODUCTION ORDERS AND OTHER RECORDS AUTHORIZING PRODUCTION

The essentials of modern organization are authority and responsibility.

Every order of any nature must be issued by an authority. The preparation of production orders is the most important function of the management and all records designed for such purposes must be clear and simple in order to reduce the possibility of misunderstandings to the minimum.

The form of production order will vary in accordance with the requirements of that branch, and it may be issued for individual orders or for group orders in weekly or monthly requirements. The former is more suitable for small establishments or in specialty manufacturing where each order is different, while the latter is usually a combination of customers' orders for similar goods to be delivered at one time. Production Orders are issued either by the Superintendent or a Production Clerk.

The Production Order may be of very simple construction, as illustration (Form 63), or combined with a record of the progress of production, as illustration (Form 64). Illustration (Form 65) is suitable for larger establishments where the deliveries made are recorded on the Production Order. This order form has been designed for either individual or group orders, often known as shop orders, and the details arranged to correspond with the requirements of a cotton spinning busi-

Order Must Leave Weaving Dep't.....	Completed.....	Order No.....
Order Must Leave Finishing Dep't.....	Completed.....	Date Issued.....
Order Must Be Shipped.....	Shipped.....	

Details of Order

Form 63. Production Order of Simple Construction Suitable for a Weaving Department

ness. With slight alterations the record is suitable for any other branch. Illustration (Form 63) is designed for a loose leaf ledger; Forms 64 and 65 for a card ledger. In many establishments a tag form of Production Order (Form 66) is used. Such a form is the most desirable for weaving plants where the product travels in individual units. Finally, there is another form (Form 67) which is a combination of a

Given Out ..... *Sept. 3, 1919* Order No. ..... *1* .....

Customer ..... *Perfect Knitting Mills, Utopia, Cal.* .....

To be Started ..... *Sept. 10–15* To be Finished ..... *Sept. 25* .....

Size ..... *20* Lbs. ..... *700* Twist ..... *R-20* Packed ..... *2 lb. Cones* .....

Special Instructions ..... *Ship complete via R. M. L. R. R.* .....

TEST RECORD

Lap	Card	Drawing	Slubbing	Intermediate	Roving	Spinning
16.25	*.133*	*.137*	*.53*	*1.07*	*2.83*	*20.85*

PROGRESS OF ORDER

	Picking	Carding	Drawing	Roving	Spinning	Winding	Shipping
Started	*Sept. 10*	*Sept. 10*	*Sept. 12*	*Sept. 13*	*Sept. 14*	*Sept. 15*	.....
Finished	*Sept. 10*	*Sept. 11*	*Sept. 12*	*Sept. 14*	*Sept. 14*	*Sept. 16*	*Sept. 25*

Form 64. Production Order Arranged for Recording Progress of Orders, Arranged for Cotton Spinning Branch

coupon and tag system, often used in weaving plants. According to this last method, one coupon is provided for each operation, and the coupons stapled and punched similarly to a tag, which is now attached to the goods at the first operation. When an operation is begun the lower part of the respective coupon is detached and sent to the office to be attached to the original order, serving as a record to show that the operation has been begun. When an operation is

PRODUCTION ORDER

Date.....

Order No.....

Customer	
Finishing and Packing Instructions	
Shipping Instructions	
Delivery Date	

Quantity	Size	Grade	Twist

DELIVERIES

Date	Cases	Quantity	Total Lbs.	Invoice Number

Form 65. Production Order of the Cotton Spinning Branch for Plants Requiring Intensive Control Method. Each Manufacturing Division Receives a Copy

CARDING DEPARTMENT

Draft.....

	Lap.-Oz.	Sliver-Grains	Sliver-Hank
Standard			

AVERAGE DAILY TESTS

.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Schedules	From	To
Spinning Department.....	.....	.....
Slubbing Department.....	.....	.....
Carding Department.....	.....	.....

Carding Started		Carding Finished	

CARDS ASSIGNED

.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Form 65a. Reverse Side of Production Order Copy to Carding Department

SLUBBING DEPARTMENT

	Slubber	Intermediate	Roving	Jack
Draft				
Hank				
Standard				

AVERAGE DAILY TEST

.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

Schedules	From	To
Spinning Department		
Slubbing Department		
Slubbing Started	Slubbing Finished	

FRAMES ASSIGNED

.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Form 65b. Reverse Side of Production Order Copy to Slubbing Department

SPINNING DEPARTMENT			
Draft		Doubling	
STANDARD TEST			
AVERAGE DAILY TESTS			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
SPINNING SCHEDULE		FROM	TO
Spinning Started		Spinning Finished	
FRAMES ASSIGNED			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

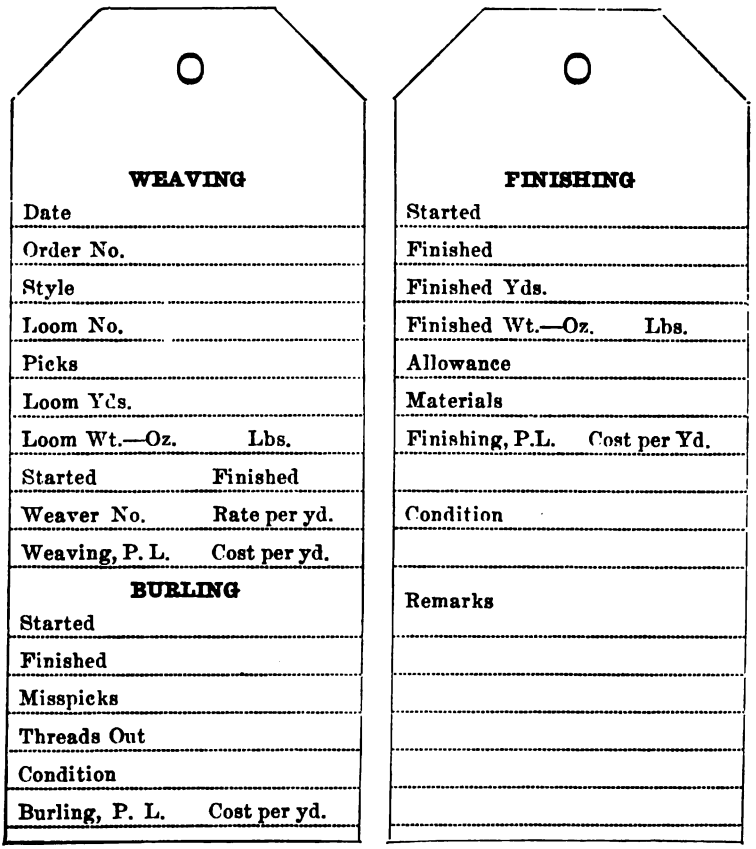
Form 65c. Reverse Side of Production Order Copy to Spinning Department

SHIPPING RECORD

DATE	CASE NO.	LBS.	TOTAL LBS.	INVOICE NO.

Form 65d. Reverse Side of Production Order Copy to Shipping Department

completed, the remaining part of the coupon is sent to the office, attached to the order, showing that the operation in question for that order has been completed. This procedure is repeated



WEAVING	
Date	
Order No.	
Style	
Loom No.	
Picks	
Loom Yds.	
Loom Wt.—Oz.	Lbs.
Started	Finished
Weaver No.	Rate per yd.
Weaving, P. L.	Cost per yd.

BURLING	
Started	
Finished	
Misspicks	
Threads Out	
Condition	
Burling, P. L.	Cost per yd.

(Face)

FINISHING	
Started	
Finished	
Finished Yds.	
Finished Wt.—Oz.	Lbs.
Allowance	
Materials	
Finishing, P.L.	Cost per Yd.
Condition	
Remarks	

(Reverse)

Form 66. Production Order in Tag Form

for all operations, thereby enabling the office to control the progress of the orders in a very simple and efficient manner. It is customary to have the order for the different departments printed in different colors.

No matter which method of control or design of forms is adopted, it should be simple in construction, this being the best

		Colors
	SPOOLING	White
	DRESSING	Pink
	DRAWING	Orange
	WEAVING	Salmon
	BURLING	Green
	DRY FINISHING	Blue
○	WET FINISHING Order No..... To be Completed..... Waste..... Warp No..... Yards..... Finished..... Operator No..... P. L. Cost per Yard.... Per Cut..... ..... Order No..... Warp No..... Started.....	Canary

Form 67. Combination Tag and Coupon Production Order Designed for Woolen Weaving and Finishing

safety device for mistakes. Illustration (Form 65), a Production Order designed for a cotton spinning plant, is used to illustrate the details. This is designed for a billing machine,

five copies being made at once. The copies are then distributed as follows:

1st copy—Control copy, to be kept at the office of the Superintendent

2nd copy—Carding copy, to be sent to the Foreman of the Carding Department

3rd copy—Slubbing copy, to be sent to the Foreman of the Slubbing Department

4th copy—Spinning copy, to be sent to the Foreman of the Spinning Department

5th copy—Shipping copy, to be sent to the Shipping Clerk

The face information of each copy is alike, but the reverse sides are arranged to give detailed information for the various production departments. In this case the control of the production is in the hands of the various departmental foremen and all the information that is kept on the original or on the Superintendent's copy is the delivery date and the deliveries made from that lot. The file of this original copy should be arranged in such a manner that sections are provided for orders in process, orders finished but not delivered and orders completed and delivered.

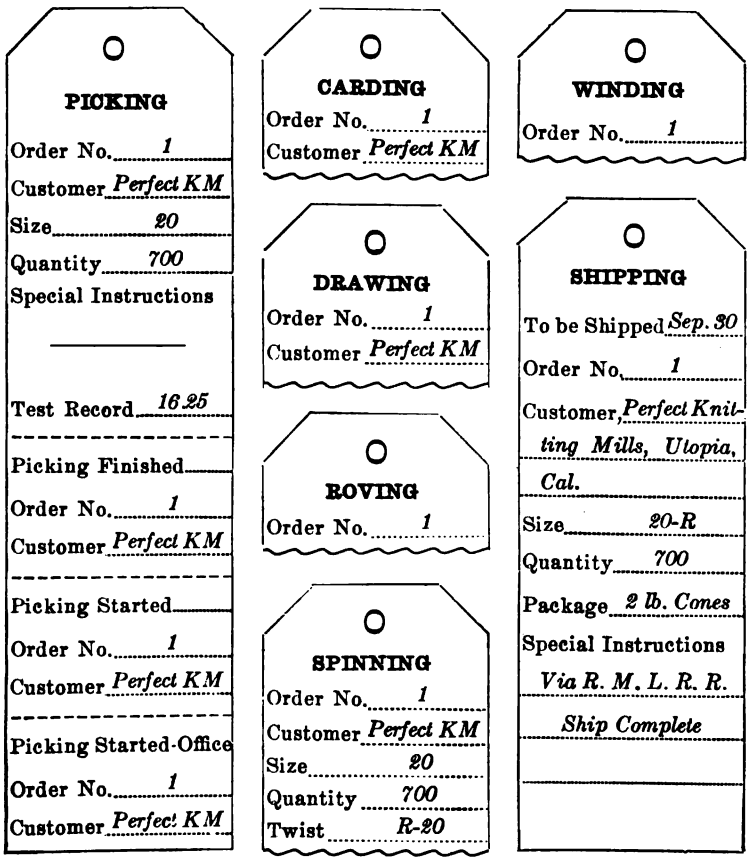
The copies assigned for the manufacturing departments are arranged to record information on the organization of the yarn, test records, schedules, starting and completion dates and assigned machinery. The details of construction of the reverse side of this Production Order, arranged for the various departments, are illustrated in (Form 65a) Carding, (Form 65b) Slubbing, (Form 65c) Spinning, (Form 65d) Shipping. The Shipping Department copy is arranged to record the delivery dates, quantities, case numbers and invoice numbers of shipping on that order or lot. This production order permits the control of the progress of production in a very simple and effective

manner. As soon as the order is completed in a department, the Production Order of that department is returned to the office of the Superintendent and filed with the original order. This departmental production order has all the information an executive wishes to know regarding the management of a department. The record has all the organization data, standards, and average tests, schedules of production, starting and finishing times, and the machinery assigned to that order. All departmental production order copies are finally attached to the original order. The reverse side of the original Production Order is arranged so as to show the deliveries to customers made on that order. This information is similar to that kept by the Shipping Clerk and is obtained from the Daily Invoice Ledger. When an order is completed, the Shipping Clerk sends his copy of the order to the office where it is attached to the original order copy and then filed away into the Completed and Delivered File.

The tag form of Production Order adapted for a cotton spinning plant is illustrated in Form 68. The original Production Order of this method is illustrated in Form 64 and is arranged for a card file system and retained in the office. The departmental Production Orders are prepared on tags, each of which, with the exception of the Shipping Department, is provided with three detachable coupons. The following is a description of the operation of this method, for use in the Picking Department.

As soon as the first lap on an order is completed, the first and second coupons are detached from the Picking Tag, the first being sent to the office and the second to the Carding Department. In the office the date of the receipt of the coupon is registered on the original Production Order. The second coupon, sent to the Carding Department, notifies the Carding foreman that the material for that order is being sent to the Carding Department. When the order is completed, the third

coupon is detached and sent to the Carding Department, notifying the foreman that in the Picking Room the order is about completed. The remaining part of the tag is sent to the office and the date of completion of the order is registered, together



Form 68. Production Orders in Tag Form Adapted to Spinning Branch

with the average tests on that order. This operation is repeated in every department until the order has been completed. The Shipping Department returns its tag to the office after the shipment has been made.

PRODUCTION ORDER

Cycle..... *15* Style..... *S27*

Order No..... *231* Size..... *32*

Month..... *April*

Ticket No.	Quantity	Truck No.	Cutting	Finishing	Boxing	Seconds
1239	*5*	*39*	*April 7*	*April 14*	*April 15*	*1/12 Doz.*

Form 69. Production Order Showing Progress of Individual Tickets Adapted to the Truck System of the Underwear Branch

For the knitting industry it is advisable to arrange the Production Orders in definite cycles in proportion to the weekly or monthly capacity of the equipment and the production tag should be provided for each unit of that plant. The tickets are provided with the order number and the progress of each unit recorded on the Production Order maintained in the office. Such an order control system will greatly assist in the completion of the orders in the proper color and size combinations. It is a well known fact that the greatest management problem in a knitting industry is the completion of the orders in complete assortment of sizes and colors, in proportion to the order requirements. The average knitting mill is always overburdened with back orders which is expensive and troublesome. Much of the cancellation and the consequent losses are preventable by the adoption of the above described order control.

A suitable Production Order form for the underwear branch is illustrated in Form 69. For each style and size requirement a separate production order is prepared. When the tickets are sent to the cutting room the ticket numbers and the quantities on each ticket are recorded on the Production Order and from this point on the coupons of the tickets serve for the registry of the dates of operations in the cutting, finishing and boxing departments.

The difference between the usual operation tickets and the tickets used in this control method is that the latter has a double row of coupons for each operation. One of them is retained by the operator for payroll purposes and the other sent to the office for the registry of the progress of the unit on the Production Order. This refers to an underwear plant. In hosiery mills, besides the usual control tag put on the bundle of the hosiery in process, a coupon tag should be attached, one for each operation, and at the completion of the operation the coupon referring

PRODUCTION ORDER

Cycle..... *27* Style..... *140A*

Order No..... *357* Size..... *9½*

Month..... *July* Color..... *Blk.*

Ticket No.	Doz.	Knitting	Looping	Dye House	Boarding	Change of Sizes	Mating	2nds and Odds
55697K	*5*	*July 15*	*July 27*	*Aug. 9*	*Aug. 15*	*1/3/9*	*Aug. 17*	*1/8*

Form 70. Production Order Showing Progress of Individual Tickets Adapted to the Truck System of the Hosiery Branch

to that department detached and sent to the office for production control purposes.

The coupon of the cutting department also shows the truck number, which information is marked on the order, while the

PICKING ORDER

Finished Date

To be finished on

Order No.	Batch No.	Yarn No.	Emulsion

BATCH MAKE-UP

%		Stock	Lbs.	Acct. No.	@	Value
.....	.....	.....	.....	....	.....	.....
.....	.....	.....	.....	....	.....	.....
.....	.....	.....	.....	....	.....	.....
.....	.....	.....	.....	....	.....	.....
100%	Total					

Emulsion Cost	....	.....	.....
Total Material Cost	....	.....	.....
Waste Lbs	....	.....	.....
Weight Delivered to Cards	....	.....	.....

Form 71. Picking Order and Production Order Combined Showing the Batch Make-up Adapted to the Woolen Industry

boxing coupon should show the imperfect product made on that ticket. This latter information is used for placing additional orders through the plant, preventing shortages of sizes caused by the seconds.

A proper form for the Production Order of the hosiery branch is shown in illustration (Form 70). The procedure is the same as described above. However, space is provided for registry in the change of sizes which often occur during the boarding operation. This information, together with that on seconds and odds, is utilized to place auxiliary orders to insure the complete assortment of sizes in the Shipping Room.

The upkeep of such production control does not require excessive clerical labor. The dates are registered with a date stamp and the ticket numbers with a numbering machine. This method of control for the production of a knitting factory is probably the simplest and the most effective of all the various systems in use today. Besides providing an authoritative record of production it shows clearly the progress of the various lots through the operations and should there for some reason be some parts of the order mislaid (which is very often the case in a knitting mill) this is discovered while the goods are yet in process of manufacture and not when the completed order is boxed up, delaying shipments and causing back orders. The tracing and rushing of such delayed bundles is an easy matter with the above method, because all information referring to the missing unit is shown on the Production Order.

One more variation in the construction of departmental Production Orders should be discussed. In the woolen industry, owing to the peculiarities of this branch, special information must be provided for the manufacturing departments.

Picking Orders, Illustration (Form 71), must be provided with instructions on the "batch make-up" and the quantity of emulsion to be used. This order also serves as a basis for the cost calculations and as a charge record for the Stock Ledger.

CARDING ORDER

Finished Date

To be finished on

Order No.	Batch Order	Batch No.	Roving
Yarn	**Card No.**	**Batch Lbs.**	**Carded Lbs.**
Card Waste		**Soft Waste**	

CARDING TIME

Started	Stopped	Time	Rate	Cost

IDLE TIME

Reason	Stopped	Started	Time	Rate	Cost

Form 72. Carding Order Adapted to the Woolen Industry

The Carding Order, suitable for this branch, is shown in Illustration (Form 72), while for the Spinning Department the detail of arrangement of the record is shown in Illustration (Form 73).

SPINNING ORDER

Completed ..... Date .....

Order No.	Batch Order	Batch No.	Roving
Yarn No.	**Twist**	**Hard Waste**	**Spun Lbs.**

Waste Record	Lbs.	%
Picker		
Card		
Mule		
Shrinkage		
Total Waste		

Produced ..... lbs. @ ..... Value $.....

Form 73. Spinning Order Adapted to the Woolen Industry

Departmental Production Instructions

In spinning plants, where the actual supervision of production is assigned to the subordinates of the departmental boss, it is desirable to prepare detailed instructions on the order, known as Department Production Instructions. In a large

plant these records are usually prepared by the Clerk or the Assistant or the Department Head and checked by the Department Head himself. Production Instructions should show all important information, such as test standards, weights, information on the yarn organization and the machine numbers assigned for that order. Upon the completion of the order, this

OPENING AND PICKING INSTRUCTION

Date.....

Order No.....

Quantity	Stock	Color Mark	Lap

STANDARD ROLL WEIGHT

Breaker.....

Intermediate.....

Finisher.....

Number of Cards Assigned.....

Number of Rolls Required Daily.....

Form 74. Departmental Production Instruction for Opening and Picking Departments of the Cotton Industry

record should be returned to the Department Head and filed for future reference. A set of Production Instructions prepared for a cotton spinning plant are illustrated for the Opening and Picking Departments (Form 74), for Carding Department (Form 74a), for Roving Department (Form 74b), and for Spinning Department (Form 74c).

CARDING INSTRUCTION

Date.....
Order No.....

Quantity	Standard Production	Sliver Grains	Sliver Hanks	Color Mark

CARDS ASSIGNED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

COMBING

Lap Grains	Ribbon Grains	Comber Grains	Standard Comber Production

COMBS ASSIGNED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

DRAWING

Delivery	Standard Head Production	Standard Grains	

HEADS ASSIGNED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Form 74a. Departmental Production Instruction for Carding Department of the Cotton Industry

ROVING INSTRUCTIONS

Date.....
Order No.....

Draft	Twist	Color Mark	

STANDARD HANKS

Slubber	Intermediate	Roving	Jack

STANDARD GRAINS PER 12 YARDS

Slubber	Intermediate	Roving	Jack

FRAMES ASSIGNED

Slubber					Intermediate					Roving					Jack				
1	2	3	4	5	21	22	23	24	25	51	52	53	54	55	91	92	93	94	95
6	7	8	9	10	26	27	28	29	30	56	57	58	59	60	96	97	98	99	100
11	12	13	14	15	31	32	33	34	35	61	62	63	64	65	101	102	103	104	105
16	17	18	19	20	36	37	38	39	40	66	67	68	69	70	106	107	108	109	110
					41	42	43	44	45	71	72	73	74	75	111	112	113	114	115
					46	47	48	49	50	76	77	78	79	80	116	117	118	119	120
										81	82	83	84	85	121	122	123	124	125
										86	87	88	89	90	126	127	128	129	130
															131	132	133	134	135
															136	137	138	139	140

Form 74b. Departmental Production Instruction for Roving Department of the Cotton Industry

SPINNING INSTRUCTIONS

Date.....
Order No.....

Size	Draft	Twist	Color Mark
Standard Hanks	Standard Grains		

PACKING INSTRUCTIONS

.....
.....
.....

FRAMES ASSIGNED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200

Form 74c. Departmental Production Instruction for Spinning Department of the Cotton Industry

CHAPTER XVII

RECORDS OF REGISTERING PROGRESS OF PRODUCTION

Cotton Spinning Operations

The greatest confusion and inefficiency is usually manifested in the records registering production. Many a management, under the false impression of saving clerical labor, omits important information on production or carries it only as far as it is absolutely necessary for computing the payroll and obtaining some general summary information. Business today demands complete records on production because, as illustrated in the previous chapters, manufacturing cost summaries have to be maintained to show for lot to lot or for month to month the fluctuations of the cost of manufacturing, not only as to the total but also as to the individual factors. Without such arrangement no permanent and immediate improvement can be made if the cost of an article is above the standard cost adopted for that period.

A notable inconsistency in manufacturing costs and their proper registry is manifested especially in the cotton spinning branch. In the majority of cotton spinning plants even today the cost of an article is based on an average. The striking thing about this method of computation is that the production figures obtained in such a manner are not even true averages because the mere adding of the production of the various sizes without considering the relation these sizes and twists have to

each other and to the corresponding production do not represent the true average. In a mill making a small range and variety of sizes this mistake may not be serious. However, in a mill making a large variety of yarns, for instance, from twelves up to thirty-sixes in all kinds of twists and plys and in carded and combed variety, the averages of production derived in the manner described above are not only worthless but in fact they are misleading as an index of cost and production. In spite of this fact there are many manufacturers and even accountants today who adhere to this method of computation because they consider it impossible to obtain dependable detailed records of departmental production without great expense.

It is granted that it is impractical and too expensive to weigh the yarn during a manufacturing process. Such procedure would also be useless because the variations of humidity and other factors would never give correct results. The only department where a sufficiently dependable record is obtainable in such a manner is the picking department. Here, by the nature of operations, each lap is put on a scale to assure the uniformity of the production. Laps over or below the standard weight are put back into the machine, and, therefore, the produced laps passed can be easily counted and their total weight represents the production of the department.

In the carding department such procedure is impractical, and we must look for another measure that will supply the desirable production figures. Such measure is available by recording the total productive machine hours used for carding a lot, which factor can be easily converted into pound cost as shown in the formula below:

$$\frac{\text{Total Productive Machine Hours of Department}}{\text{Total Productive Labor of Department}} = \text{Productive}$$

Labor Cost per Hour $\times$ Productive Machine Hours of Lot=Productive Labor Cost of Lot

Picking Production of Lot – Card Waste of Lot = Card Production of Lot

$$\frac{\text{Productive Labor Cost of Lot}}{\text{Card Production of Lot}} = \text{Productive Labor Cost of Lot per Pound}$$

Therefore, if we construct a production record that will show day by day the number of machines in the various departments, assigned to an order or to a lot, together with the number of hours that represent the productive hours of these machines we can conveniently apportion the total productive labor of this department in relation to the productive machine hours used on a lot or an order per day, week, or any other time measure. This procedure is illustrated in the following manner.

Let us presume for a simple illustration that the carding department of a cotton spinning plant has ten cards and they work ten hours a day. This means one hundred productive machine hours. During the day the cards were working on three orders divided in the following manner:

3 cards	on	order	A	of	10	hours	each	=	30	Productive Machine Hrs.
4 "	"	"	B	"	10	"	"	=	40	" " "
1 "	"	"	B	"	4	"	"	=	4	" " "
the same card	"	"	C	"	6	"	"	=	6	" " "
2 "	"	"	C	"	10	"	"	=	20	" " "
							Total	=	100	" " "

According to the above tabulation the production of the department would be divided in the following manner:

Order	A	30	Productive	Machine Hours
"	B	44	"	" "
"	C	26	"	" "

Let us also presume that a total productive labor cost for that day for the carding department amounted to ten dollars. Therefore, the productive labor cost for each order will be in proportion to the productive labor hours used in that order by the department and will amount to, in dollars and cents

Order A.	$3.00
Order B.	4.40
Order C.	2.60
Total.	$10.00

Let us further presume that the batting delivered by the picking department for each order was the following:

Order A.	350 pounds
Order B.	500 pounds
Order C.	300 pounds
Total.	1,150 pounds

During the day the cards for each order have been stripped and the strippings weighed and recorded before sent to the waste house, and such waste amounted to

Order A.	30 pounds
Order B.	40 pounds
Order C.	20 pounds
Total Cards Stripping Waste.	90 pounds

During the day the carding department collected the following sweeping waste:

Clean Sweepings	30 pounds
Oily Sweepings	15 pounds

According to the above data the direct labor spent on each lot and the stripping waste made on each lot is definitely known and can be charged directly to the respective cost and control records.

The sweeping waste can be safely apportioned to the various orders in proportion to the productive machine hours used for the various orders during the period.

Clean sweepings apportioned according to the productive

machine hours spent on each order would therefore give the following result:

Order A to be credited with clean sweepings.	9.00 pounds
Order B to be credited with clean sweepings.	13.25 pounds
Order C to be credited with clean sweepings.	7.75 pounds
Total.	30.00 pounds

Oily sweepings apportioned in a similar manner would give the following credits to the various orders:

Order A.	4.50 pounds
Order B.	6.625 pounds
Order C.	3.875 pounds
Total.	15.0 pounds

The actual production of the carding department including invisible shrinkage would be, therefore, on Order A, 306.50 pounds, on Order B, 400.125 pounds, on Order C, 263.275 pounds.

As demonstrated by this illustration, accurate cost and production records are obtained without the impracticable task of weighing and checking every lot. This being true, it matters little whether three or one hundred lots are produced at one time, also whether a lot amounts to one hundred or ten thousand pounds, and whether the production of a lot is assigned to one or one hundred machines or whether the completion of the order requires one day or a month. As long as the above procedure is employed the right results will be obtained. For the combing, drawing, roving, spinning and twisting operations the procedure is the same as above.

Manufacturing cost and production records which accumulate the information obtained in this manner are illustrated in Form 61 and Form 62. The accumulating records, illustration (Form 61), should be closed at the completion of a lot, and the

totals transferred to the cost summary record, illustration (Form 62). The average cost for the month for each size or twist may be obtained from this cost summary. These averages will not be the inaccurate and misleading figures discussed at the beginning of this chapter but real averages for each size, grade, or twist of yarn, and the total production shown on these summaries will be dependable.

If the organization of the yarn manufacturing is such that one card roving is used for several sizes or twist, the procedure remains the same, and the control of such roving is maintained on a mutual record.

There is one more important point that needs consideration. This is the cost of carding of combed yarns. *The carding cost of combed yarns should not be figured on the production of the carding department, but on the production of the combing department.* Otherwise, the results will be misleading and the cost shown on the books will be below the actual cost.

The records of production may be designed for each individual phase, such as quantity produced, waste produced, hours run and payroll, or, all such information may be combined into one record serving for all purposes. This latter method is more desirable because it saves clerical labor and cuts down the number of records to a minimum, a very desirable thing for an organization.

Production Records for Spinning Departments

The production records discussed in this section have been designed to provide combined records and in accordance with the machine hour method of computation which was discussed in the beginning of this chapter. These forms are maintained by the assistant foreman or section hand as far as the production and employes' list is concerned, and then sent to the overseer of the department. If it is desirable he might copy certain information of special interest to him, but in all circumstances

he should inspect each report carefully as far as test records, idle machinery, number of employes and waste production is concerned. The records are then sent to the payroll division where the daily earnings of the individual workers are computed and copied upon the payroll. From the paymaster these records should be sent to the clerk in charge of the material records who will charge the waste accounts from the information showing how much waste has been produced in the various departments, and then production records are sent to the cost clerk who extends the cost of production and waste production to the cost accumulating records. Finally these records are sent to the office of the superintendent where they are filed away according to dates and if desirable the totals of the machine hours, idle machines and other information are extracted into a summary report. It requires very little argument to prove that this is an ideal way of arranging the control records, because the fewer the number of records the greater the efficiency of control and the smaller the possibility of mistakes.

A daily picking report designed according to the above principle is illustrated in Form 75. This record is planned to take care of six different lots or orders at the same time and there are very few plants where during the day a greater number of orders are carried through the picking department. However, if such be the case the record can be extended to any number of lots or orders desired. If such extension would make the record cumbersome to handle, two or three sheets may be used for a day without lessening the efficiency of the procedure. The individual items on the record are self-explanatory and space is provided in the proper order for all the information the management should know, not more and not less. The lower part of the record is arranged for the daily employes' roster divided into two sections.

Assigned Labor

Unassigned Labor

Date.....

DAILY PICKING REPORT

Order or Lot Number							
Finisher Number							
Standard Lap							
Regular Rolls							
Overweight Rolls							
Underweight Rolls							
Lbs. Delivered to Cards							
Lbs. Mote Waste							
Hrs. Run							
Hrs. Idle							
Assigned Productive Labor							
Unassigned Productive Labor							
Total Productive Labor							
Productive Labor Cost per Lb.							
.....Lbs. Waste @ per Lb.							
Value of Waste							

No.	Name Assigned Prod. Labor	@	Hrs.	Total $	Hrs.	Total $	Hrs.	Total $	Hrs.	Total $

	Productive Labor Unassigned	Non-Productive Labor Dep't Burden	Non-Productive Labor General Burden	
				Total Lbs. Produced
				Total Waste Lbs.
				Total Productive Labor Cost
				Total Non-Productive Labor Cost
				Total Labor Cost Per Hr.
				Waste %

Form 75. Daily Picking Report for Cotton Industry

Under assigned labor is understood the employes who are directly connected with the manning of a definite set of pickers. The earnings of such labor on this record are charged directly to the lot or order numbers. Unassigned labor represents such general picking room help as is essential to the operation of the department such as moving the finished laps and performing general nondescript jobs. Such labor comes under three classifications:

Productive Labor
Non-productive Labor—Departmental Burden
Non-productive Labor—General Burden

Unassigned productive labor is apportioned to the various lots or orders in relation to the weight of laps sent to the cards on the various orders.

The mote waste collected from the picker is weighed separately before being sent to the waste house and the weight registered under the respective order or lot number on the record. The information referring to production is obtained in a simple manner. Since each lap taken from the finisher picker must be weighed and all over or under weight laps sent back to the breaker, the production of the picker is obtainable. The finisher hand whose duty it is to take off the rolls should be provided either with a blackboard or with a pad of paper and he should mark each lap roll passing through on this record. The marks should be arranged in groups of five (𝍸), separate sections reserved for standards, over weights and under weights. In most cotton mills this system is already adopted and at the end of the day this record will serve for the entries in the daily picking report.

A daily carding report is illustrated in Form 76. The general arrangement is the same as for the previous report. The card numbers are recorded for each order in the space provided, for the first digit numbers are printed in advance,

Date.....

DAILY CARDING REPORT

Order or Lot No.				
Standard Grain and Hank				
Number of Cards Assigned				
CARD NUMBERS AND TEST RECORDS	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
CARDS IDLE				
Card No. / Hrs / Card No. / Hrs	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
Total Cards / Total Hrs.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Direct Strip Waste				
Proportioned Clean Sweep				
Proportioned Oily Sweep				
Total Waste and Value				
Proportioned Prod. Labor Total				

No.	Name	Occupation Symbol	Hrs.	Rate	Total	No.	Name	Occupation Symbol	Hrs.	Rate	Total

WASTE COLLECTED	Total	PROPORTIONED TO ORDERS				PRODUCTIVE LABOR DISTRIBUTION					
							IDLE MACHINE HOURS	ORDER NUMBERS			
Clean Sweep							CHARGE TO NON-PROD. LABOR				
Oily Sweep											
Total						MACHINE HRS.					
						Amount					

Form 76. Daily Carding Report for Cotton Industry

and the second digits are written in. This section of the record is arranged in such a manner that almost any combination can be recorded. The same time a second digit added to the printed number also indicates that the machine was running all day on that order. If a card is running only a half a day or a quarter of a day on an order, one-half or one-quarter is marked under the machine number besides the second digit number. This method can be illustrated in the following manner:

In a record the serial of numbers

1	2	3	4	5
6	7	8	9	0

are repeated for each lot or order section, three and one-half times, permitting a card assignment for an order up to thirty-five machines. Let us presume that fifteen cards are assigned, of which number thirteen cards worked a full day, one card one-half a day and one card three-quarters of a day. The card numbers assigned were from thirty to forty-five and this information is recorded in the following manner:

1	2	3	4	5
6	7	8	9	30
31	32	33	34	35
36	37	38	39	40
	½			
41	42	43	44	45
		¾		
6	7	8	9	0
1	2	3	4	5

Now the record shows that the fifteen cards worked on the order fourteen and one-quarter times eight hours or altogether one hundred and fourteen productive machine hours.

It is also essential that the tests made during the day are

Date.....

DAILY COMBING AND DRAWING REPORT

Order or Lot No.				
Standard Comber Grain				
Standard Drawing Grain				
Number of Combs Assigned				
Number of Heads Assigned				
Comb Numbers and Test Records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Combs Idle	6 7 8 9 10	6 7 8 9 10	6 7 8 9 10	6 7 8 9 10
Comb No / Hrs / Comb No. / Hrs	11 12 13 14 15	11 12 13 14 15	11 12 13 14 15	11 12 13 14 15
Head Numbers and Test Records	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Heads Idle	6 7 8 9 10	6 7 8 9 10	6 7 8 9 10	6 7 8 9 10
Head No. / Hrs / Head No. / Hrs	11 12 13 14 15	11 12 13 14 15	11 12 13 14 15	11 12 13 14 15
Direct Comber Waste				
Proportioned Clean Sweep				
Proportioned Oily Sweep				
Total Waste and Value				
Proportioned Prod. Labor Total				

Waste Collected	Total	Proportioned to Orders				Productive Labor Distribution					
							Idle Machine Hrs.	Order Numbers			
Clean Sweep							Charge to Non-Prod. Labor				
Oily Sweep						Machine Hrs.					
Total						Amount					

No.	Name	Occupation Symbol	Hrs.	Rate	Total	No.	Name	Occupation Symbol	Hrs.	Rate	Total

Form 77. Daily Combing and Drawing Report for Cotton Industry

recorded as a proof of the condition of the machines. Let it be presumed that the tests are registered according to the hanks, and the yarn is No. 16 for which the standard hank number of the card sliver would be equal to .139. Supposing a test was made of the sliver produced No. 44 is equal to .138. Therefore, under the corresponding machine number this test is entered by eliminating the decimal point and the third digit of the figure, which will appear in the record in the following manner:

43	44	45
	38	

The stripping waste should be separated according to lot numbers and weighed at the end of each day and recorded under the proper section, while sweepings and other waste recorded in total according to divisions such as clean sweep and oily sweep waste. The number and the name of employes, the occupation symbol and the hours are recorded in the department and then the record is despatched to the various clerical stations as described for the previous section. In this case, the productive labor is proportioned according to the productive machine hours and the proportions of charges entered into the section headed "Productive Labor Distribution." The clean sweep and oily sweep is carried through a similar method under the section headed "Waste Collected—Proportion to Orders." From this information the Cost Clerk extends the figures of production cost and waste for the various lots or order numbers.

Space has been provided for idle machinery for recording the card numbers and the hours idle for each, also total idle machine hours. It is self-evident that idle machinery cannot be charged to the orders and the corresponding proportion of the productive labor is charged to non-productive labor as a departmental expense. The section of productive labor distribution is arranged to take care of such emergency.

Date.....

DAILY ROVING REPORT

Order or Lot Number																								
Standard Hanks Doubling and Twist																								
Number of Frames Assigned																								
Slubber Numbers and Test Records	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0				
Idle Machine Hrs.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
Intermediate Numbers and Test Records	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0				
Idle Machine Hrs.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
Roving Numbers and Test Records	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0				
Idle Machine Hrs.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
Jack Numbers and Test Records	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0	6	7	8	9	0				
Idle Machine Hrs.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5				
Proportioned Clean Sweep																								
Proportioned Oily Sweep																								
Total Waste and Value																								
Direct Productive Labor																								
Proportioned Productive Labor																								

Waste Collected	Total	Proportioned to Orders			Productive Labor Distribution	Idle Machine Hrs. Charge to Non-Prod. Labor	Order Numbers			
Clean Sweep										
Oily Sweep										
Total Waste										
					Machine Hrs.					
					Direct					
					Pro-portioned					
					Total					

Form 78. Daily Roving Report for Cotton Industry

It is self-evident that the labor cost of a Carding Department divided in such a manner will be just, representing the true cost and the method of distribution so simple that it will require hardly more labor than a haphazard method so frequently employed in the spinning branch of the textile industry. If the space provided for the registry of the names of employes is insufficient as arranged on the illustration, the reverse side of the record can be utilized for such purpose.

The Daily Report of the Combing and Drawing Sections is arranged in general in the same manner as that of the Carding Division, illustration (Form 77). The number of machines in this division not being extensive it is permissable that the comb and drawing head numbers be printed in advance as illustrated. The machine numbers assigned to the respective lot or order are indicated by the circle around that number, like the following example:

1	2	3	④	⑤
⑥	⑦	8	9	10
11	12	13	14	15

indicating that to a particular order machines 4, 5, 6 and 7 were assigned. The comber waste is recorded directly for the various lots or orders while sweepings and other miscellaneous wastes are proportioned as described for the Carding Division.

The Daily Report for the Roving Department is illustrated in Form 78. In general construction this record is the same as the previous one, permitting the indication of the machines assigned and tests made for each class of roving machine such as slubbers, intermediates, roving and jacks. The reverse side of this record is illustrated in Form 78a, arranged for the Daily Payroll, with space reserved for the employe's number, name, occupation symbol, hours worked, rate and total, also for charging the labor cost of each individual either directly to an order number or to be proportioned

No.	NAME	Occupation Symbol	Hrs	Rate	Total	Charge to Orders				To be Proportioned

Form 78a. Daily Roving Report. (Reverse Side of Form 78)

This record eliminates the conventional time book, and used directly for payroll entries

in relation to productive machine hours. In this division there are employes who are directly assigned to certain machines and others such as truck movers, etc., whose labor must be proportioned to the orders according to the productive machine hours.

The Daily Spinning Report, illustrated in Form 79, is in construction similar to the Daily Roving Report, designed to meet the peculiarities of this department. It also has space for recording total production in pounds and in hanks. The reverse side of this record, illustrated in Form 79a, is similar in general arrangement to the Roving Department Record but it carries information that refers to the hanks and pounds produced, frames attended, etc. This payroll is arranged for piece work as well as for day work.

The above records represent all the direct production control records of a cotton spinning mill arranged according to the best conception of an efficient management control.

Worsted Spinning Operations

The principles of production recording as explained for cotton spinning is also true for worsted and woolen spinning. The measurement of the flow of product is, therefore, the productive machine hour. In the worsted industry the departmental division of operations is as follows:

Picking
Carding
Top Making (including gilling and combing operations)
Roving
Spinning

The procedure of control is greatly simplified by the fact that the tops can be weighed conveniently before the roving process. The wool stock is also weighed before the picking operation for each individual batch, and even if the same set of cards

Date.....

DAILY SPINNING REPORT

Order or Lot Number				
Size and Twist				
Standard Hank				
Number of Frames Assigned				
Frame Numbers and Test Records	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
Frames Idle				
Frame No. / Hrs. / Frame No. / Hrs.	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
Direct Soft Waste				
Direct Hard Waste				
Proportioned Waste				
Total Waste and Value				
Direct Productive Labor				
Proportioned Productive Labor				

Waste Collected	Total	Proportioned to Orders			
Clean Sweep					
Oily Sweep					
Total Waste					

Productive Labor Distribution	Order Numbers			
Machine Hrs.				
Spinning				
Doffing				
Total				

TOTAL PRODUCTION

LBS.				
HANKS				

Form 79. Daily Spinning Report for Cotton Industry

and combs are employed continuously on one style of stock, the batches should be run out at convenient times to permit the stripping of the card sets which again provides an opportunity to complete such batches at the combs and permit the comparison of picked and combed production.

In most instances the stock is changed frequently enough to make such comparisons possible at proper intervals.

The batches are recorded in the picker room on a Picking Record shown in illustration (Form 80). This record is so constructed that in case several sortings make up the batch the actual weight of each sorting is recorded separately. The time required in picking a lot is also recorded and this represents the machine hours used for that batch, being the information needed for determining the productive labor cost.

At the end of the week the total time recorded on all picking records is added up, thereby obtaining the total machine hours of that department and the productive labor cost for that week divided by this total machine hours is the hourly cost for the week. The productive labor cost of a batch, therefore, will be the time of that batch multiplied by the hourly labor cost. If a batch is double picked the same method of labor computation is used. When a batch is finished the waste is collected, weighed and recorded on the Picking Record.

The control of carding procedure is very similar to that of picking. Such Carding Record is given in illustration (Form 81) and is constructed to show, besides the actual time spent on a batch each day, the idle or non-productive time which cannot be charged to individual batches but which must be accumulated and used as an expense item for departmental burden or overhead. The waste collected from the cards is also recorded for each batch and when the batch is completed the record is sent to the office where the total productive hours are determined and the productive labor cost obtained in a manner as explained for the picking operation. Stripping

No.	Name	Hrs.	Occ. Symb.	Hanks	Frames	Lbs.	Rate	Total		Charge to Orders					To be Proportioned

time, if necessary, after the completion of a batch should be included in the running time while grinding and adjustments considered as idle time—an item for the general burden.

The top making or combing operations are controlled on

PICKING RECORD

Order No.....	Date.....	
Batch No.....	Size.....	Quantity.....

BATCH

Stock	Lbs.
.....	.....
.....	.....
.....	.....
.....	.....
Total	

Emulsion Gallons.....

Started	Finished	Hours
.....	.....	.....

Picking Waste.....	Prod. Labor Cost.....

Form 80. Woolen and Worsted Picking Record

the same principle as described above. The auxiliary machinery, such as gills and back washers, need not be controlled since they are a supplementary equipment to the combers. Illustration (Form 82) is a Production Record designed for combing operations. The total productive labor cost for the

week must naturally include the gilling and combing help and hourly cost for the week is the amount of this payroll divided

CARDING RECORD

Order No..... Set No.....

Batch No.		Roving Tests
Size	.....	.....
Quantity of Batch		

SET RECORD

Running				Idle	
Date	Hrs.	Date	Hrs.	Date	Hrs.
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
Total Prod. Hrs.				Total Idle Hrs.	

Waste Collected				Productive Labor Cost
.....	.....	.....	.....	Hrs. .....
.....	.....	.....	.....	Rate .....
.....	.....	.....	.....	$ .....
Total				

Form 81. Woolen and Worsted Carding Record

by total combing hours. A suitable Production Record for this department is illustrated in Form 82.

The weight of tops produced daily for each batch or lot is recorded on a form similar to illustration (Form 83). On

this record for each order or batch unit a separate section is provided and every section is subdivided into stock and roving departments, thereby permitting a direct registry of the

TOP MAKING RECORD

Order No..... Set No.....

Batch No.		Test Records
Size		
Quantity of Batch		

SET RECORD

Running				Idle	
Date	Hrs.	Date	Hrs.	Date	Hrs.
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
Total Prod. Hrs.				Total Idle Hrs.	

Noils Collected				Productive Labor Cost
.....	.....	.....	.....	Hrs. .....
.....	.....	.....	.....	Rate .....
				$
Total				

Form 82. Worsted Combing, (Top Making Record)

final distribution. Of the tops sent to the stock room, stock records should be maintained for which the above described daily reports will form the basic entry. The method of con-

trol of stock of materials has been fully covered in Chapter XIII and the corresponding illustrations will supply the required information. Of the noils a similar record should be maintained.

For commission combing plants such daily report should also serve as a shipping record and the form must be altered correspondingly to show the weights and the numbers of the

DAILY REPORT OF TOP PRODUCTION

Date.....

Order No..... Batch No..... Grade.....		Order No..... Batch No..... Grade.....		Order No..... Batch No..... Grade.....		Order No..... Batch No..... Grade.....		Order No..... Batch No..... Grade.....		Order No..... Batch No..... Grade.....		Order No..... Batch No..... Grade.....	
To Stock	To Roving	To Stock	To Roving	To Stock	To Roving	To Stock	To Roving	To Stock	To Roving	To Stock	To Roving	To Stock	To Roving

Form 83. Daily Report of Top Production

bales packed. Commission combers should also render the customers a monthly statement of stock on their premises and the suitable form for this purpose is illustrated in Form 84.

The roving and spinning operations in the worsted industry should be controlled in the same manner as described for cotton spinning, suitable production records being illustrated in Forms 78, 78a, 79, 79a, but a change of the wording must be made to correspond with the units and expressions used in the worsted industry.

Woolen Spinning Operations

There are only three divisions of control in the woolen spinning industry, namely:

Picking
Carding
Spinning

The procedure of control and the records for picking and carding operations are practically the same as for the worsted branch and illustrations (Forms 80 and 81) can be used without change. For the spinning operations, however, instead of ring and cap frames, the mule is used and here the nature of the work requires a different method of control. Whether the spinners are paid by the pounds produced or compensated by an hourly rate, it is desirable that a record be made of each individual doffing. A record for this purpose, known as the spinner's tag, is illustrated in Form 85 and serves for production, payroll and cost recording. The tag is divided into two sections and provided with a serial number and all other necessary information. From the upper part of the tag the cost and production records are prepared. The lower part of this tag is the spinner's check from which the earnings are computed. Each doffing is weighed and the tare, consisting of the weight of the basket and of the empty bobbins is deducted. The number of the doffing of that particular batch made by a spinner is punched by the overseer, section hand, or other employe entrusted with weighing at the bottom of this record. By this arrangement frauds which have made piece rate compensation in mule spinning so difficult are almost entirely eliminated because the check punches must follow in consecutive numbers and the production of the individual spinner can be controlled with reasonable safety.

In mills where the individual doffings are kept separately in a bag until used, a doffing tag should be attached for identification, a suitable form for which is illustrated in Form 86.

THE WOOL COMBING CO.
Monthly Statement of Stock
THE PROPERTY OF

Date.....

M.....

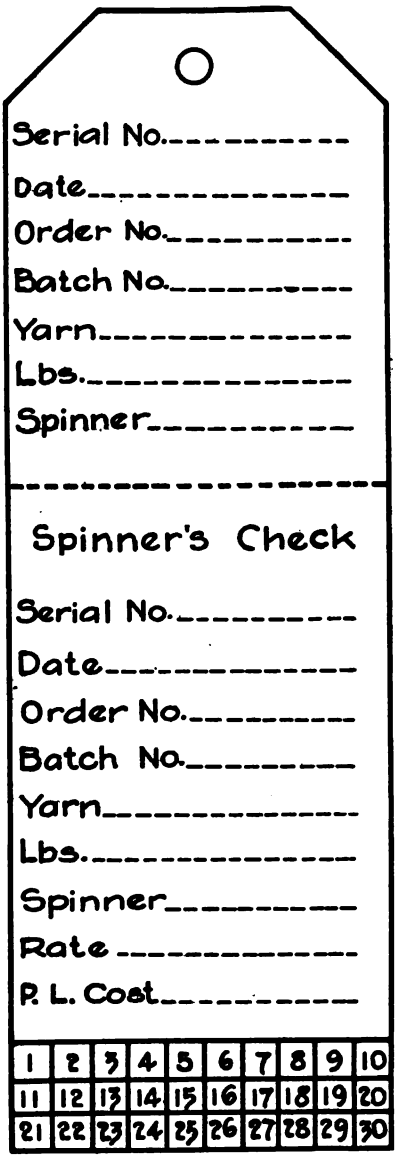
ORIGINAL BALES				WOOL IN PROCESS				NOILS		
LOT NO.	GRADE	BALES	WEIGHT	BATCH	ORDER	TOP NO.	WEIGHT	TOP NO.	BAGS	WEIGHT

SORTINGS				TOPS				WASTES		
	GRADE	SORTING	WEIGHT	ORDER NO.	TOP NO.	BALES	WEIGHT	GRADE	BAGS	WEIGHT

No Allowance has been made for air gains and air shrinkages. If not notified otherwise after 5 days of receipt of this statement, it is presumed that the balances agree with your accounts.

THE WOOL COMBING CO.

Form 84. Monthly Statement of Commission Stock



Form 85. Spinner's Control Tag for Mule Spinning

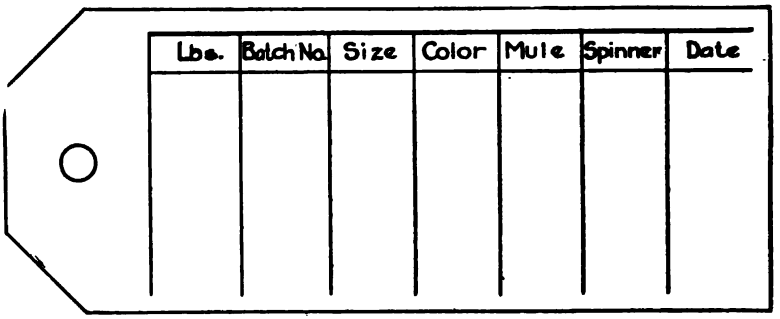
Hard waste made by the spinners should be recorded for each batch and for each spinner, the waste collected as often as necessary and the record sent to the office where every week the cost records have to be credited with the waste and the percentage computed. The general construction of such waste report is illustrated in Form 87, the size of which will vary with the requirements of the plant.

Control Records of Long Fibre Spinning Operations

Flax, Hemp, Jute and Ramie fibre spinning operations constitute the long fibre group and their control is practically identical.

The processes of refinement previous to roving are obtained through a series of gilling operations and this suggests the adoption of the control as described for the worsted spinning branch. In this branch for fine spinning heckling will represent the picking and carding operations and the production will be measured by the ma-

chine hours used for a lot of flax. The waste or tow fibre deducted from the original lot weight will yield the quantitative information.



Form 86. Doffing Identification Tag

The following operations are to be controlled similarly as the roving and spinning described for cotton and worsted control but with such changes in the description and wording of the forms as is necessary for the branch.

MULE SPINNING WASTE REPORT

Week.....

Batch		Batch		Batch		Batch		Batch		Batch		Batch	
Spinner	Lbs.	Spinner	Lbs.	Spinner	Lbs.	Spinner	Lbs.	Spinner	Lbs.	Spinner	Lbs.	Spinner	Lbs.

Form 87. Mule Spinning Waste Report

Silk Throwing Operations

The last of important textile branches in connection with the spinning operations to be considered is the silk throwing. Technically speaking this is a winding, doubling, and twisting operation, because silk is a continuous fiber while cotton and

BALE RECORD

Date.....

Bale No.	Chop	Opened By

Book	Skeins	Weight	Book	Skeins	Weight
Total Skeins			Total Weight		

Form 88. Bale Record for Silk Throwing

wool are short fibre. The machine hour basis of production control in principle is correct for this branch also but an actual weighing of the product between the operations is at the same time desirable for some very important reasons. Silk is the most expensive fiber in use in the textile industry. There is a systematized underground channel of commerce through which stolen silk can be easily disposed of. The activities of this under-channel gentry costs the silk industry many millions of dollars a year. It is a well known fact that many of the so-

BOOK RECORD

Date.....

Bale No.	Chop	Examiner

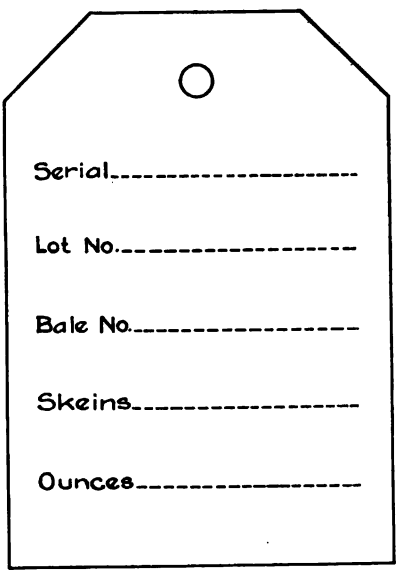
Skeins		Weight	
Passed		Rejected	
Skeins	Weight	Skeins	Weight

Form 89. Book Record for Silk Throwing

called silk fences maintained in the past, traveling representatives who approached the employes of the various silk plants, encouraging dishonesty and paying cash for any amount of dishonestly obtained silk. A few skeins of silk appropriated by dishonest employes occasionally will mean many thousand dollars of losses during the year, and as long as these leeches of the industry are not eliminated from the field extreme measures of control of the production are a necessity in the silk industry.

We are forced to admit that no system of control is yet devised that is absolutely proof against fraud but, nevertheless, there is a possibility of developing a method of control in such a manner that systematic fraud cannot be carried on undetected for any length of time yet not making the method of control too expensive for maintenance.

With the exception of the soaking operations all other work can be compensated on the piece work basis and the product is moved during operations in definite units which makes the use of standardized trays or pin racks possible. The operations of silk throwing are divided into



Form 90. Bundle Tag for Silk Soaking

Soaking
Winding
Doubling
Twisting

Control of Silk from the Bale to the Winding Operation

Raw silk is shipped in bales, each bale containing a certain number of bundles usually called books. The number of skeins to a book may vary and, therefore, the first step should be to count the number of skeins in each book before they are sent to the bundling bench. Therefore, when a bale is opened a bale record should be made out similar to the one shown as illustration (Form 88). The number of skeins and the weight of each book is entered on this record. At the same time a book record, illustration (Form 89), should be prepared for each book.

Form No. 16

SOAKING MEMORANDUM

Date	Lot No.	Bale No.	Grade	Soap	Oil	Soaked

BUNDLED

Tag No.	No. of Skeins	WEIGHT Lbs.	WEIGHT Oz.	Tag No.	No. of Skeins	WEIGHT Lbs.	WEIGHT Oz.	Tag No.	No. of Skeins	WEIGHT Lbs.	WEIGHT Oz.	Tag No.	No. of Skeins	WEIGHT Lbs.	WEIGHT Oz.

The skein examiners will record for each book the number and the weight of the skeins that have been passed and rejected. Previous to the soaking operation the skeins are bundled into convenient units and each bundle should be provided with a linen tag, illustration (Form 90), upon which is marked in indelible ink the bale number, number of skeins and weight, after which the skeins are ready for the soaking operation. The above described procedure may seem elaborate, but considering the fact that the most convenient shape of silk for the dealers of stolen property is in its original shape, the above procedure is worth while because its continuous control makes frauds very difficult.

A soaking memorandum, as illustration (Form 91), should be prepared which should accompany the lot to winding. The weighing of the silk in this stage of manufacture is useless because the degumming process has reduced the weight of the silk while the water increased it and its moist condition prevents the determination of the actual weight conveniently. The check of the silk sent to winding is therefore obtained by counting the bundles and the number of skeins in each bundle which must correspond to the record on the tag.

Control of Winding and Doubling Operations

The payment of the winding operations should be made on the pound product most conveniently expressed in skein units. The silk skeins, for a certain dennier or size, are fairly uniform, containing about the same amount of yardage and the number of spools that are to be produced from a definite number of skeins can be determined with reasonable certainty. Therefore, the check upon the product delivered and upon waste will be the number of spools delivered from a definite number of skeins. The product between the winding and doubling operations should be carried in trays of twenty-five spool capacity, which trays and spools being of uniform weight

Order No..... Delivery Wanted.....

Article..... Lbs.....

WINDING			DOUBLING			RE-DOUBLING			SPINNING		
Date	Lbs. per 10 Hrs.	Spindles	Date	Lbs. per 10 Hrs.	Spindles	Date	Lbs. per 10 Hrs.	Spindles	Date	Lbs. per 10 Hrs.	Spindles

Operator	Date	Tray No.	Lbs.	Oz.	Operator	Date	Tray No.	Lbs.	Oz.	Operator	Date	Tray No.	Lbs.	Oz.	Operator	Date	Tray No.	Lbs.	Oz.

Form 92. Silk Throwing Production Sheet

158

Winding.....	Total lbs.....
Bale No.....	Tray lbs.....oz.
Grade.....	Spool lbs.....oz.
Order No.....	Net lbs.....oz.
Spools.....	Operator.....

Date.....

Form 93. Silk Winding Tray Record

755

Double.....Ends	Total lbs.....
Bale No.....	Tray lbs.....oz.
Grade.....	Spool lbs.....oz.
Order No.....	Net lbs.....oz.
Spools.....	Operator.....

Date.....

Form 93a. Silk Doubling Tray Record

254

Re-Double.....Ends	Total lbs.....
Bale No.....	Tray lbs.....oz.
Grade.....	Spool lbs.....oz.
Order No.....	Net lbs.....oz.
Spools.....	Operator.....

Date.....

Form 93b. Silk Re-Doubling Tray Record

will give a standard tare for all product through the operations. Accordingly each tray, as soon as it is filled by an operator, is weighed, the net weight entered on the production sheet according to the operator's number, date, tray number and weight while the tray is provided with a control coupon and sent to the next operation. Such production control record is illustrated in Form 92 covering the winding, doubling, redoubling, and twisting operations. The record should be maintained by the clerk assigned for checking production. Tray records, which are made out simultaneously with the entry on the production sheet are illustrated in Forms 93, 93a, 93b and 93c for winding, doubling and redoubling operations respectively. Each such tray record is provided with a serial number and for each department it should be printed in a different color. The operators' records are most conveniently maintained on Operators' Accounts, as illustrated in Form 94, maintained in a file by the checking clerk, and it should be accessible to the employes. At the end of the week these records are used for payroll computations.

ACCOUNT WITH OPERATIVE

Week _____

Name _____ No. _____

Date	Tray Number	Grade and Size	Lbs.	Rate	Total

Hours Worked	Earnings	Efficiency

Form 94. Account with Operator

Control of the Twisting Operation

The control of the twisting operation is the continuation of the method described above, the only difference being that

the yarn twisted receives its final check only after it has been skeined and reeled. The twisted silk is therefore most conveniently carried in a pin tray with a tag showing the lot number and the twister's number. In the reeling room the reeled skeins are sorted according to the twisters and twice during the day their product is weighed and credited to the respective twister's account which is similar to the one illustrated in Form 94, but in details arranged to conform to the requirements.

The control records are sent to the office as soon as a lot is completed. The procedure of cost determination and waste calculations is similar to that described for the other spinning branches.

Control of Intermediate Processes (Between Spinning and Weaving)

Between spinning and weaving there are a number of intermediate operations, the control of which forms an independent group. It is essential that a short review be made of the preparatory processes that precede the weaving or knitting operations. These processes are

Spooling
Winding
Warping
Quilling

The control of these operations and the method of recording the performance can be made very simple and effective because the product in this stage of process can be conveniently weighed either before or after it has been assigned to the operators. For spooling and winding operations the production cost and earning records are most conveniently maintained on a form similar to illustration (Form 95). The weight of the yarn assigned to a winder and the waste made

Form 7

Operator			No.		Week of			
Size & Ends								
Lot No.								
Assortment								
Mach & No. Heads								
Started								
Finished								
Lbs. Assigned								
	Total		Total		Total		Total	
Cones & Cops.	Total		Total		Total		Total	
Lbs. Waste								
	Total		Total		Total		Total	
Produced								
	Total		Total		Total		Total	
Returned								
Elapsed Time								
Standard "								
Efficiency								

Total Elapsed Time		Hourly Rate	
" Standard "		Total Weekly Earnings	
Average Efficiency		Deductions or Additions	
Total Production			
" Cones & Cops.			
" Waste		Size & Ends	
" Shr. or Gain		Cost/Lb.	
Waste %		Std. Cost/Lb.	
Shr or Gain. %			

Form 95. Winding Production and Cost Record for Intensive Control

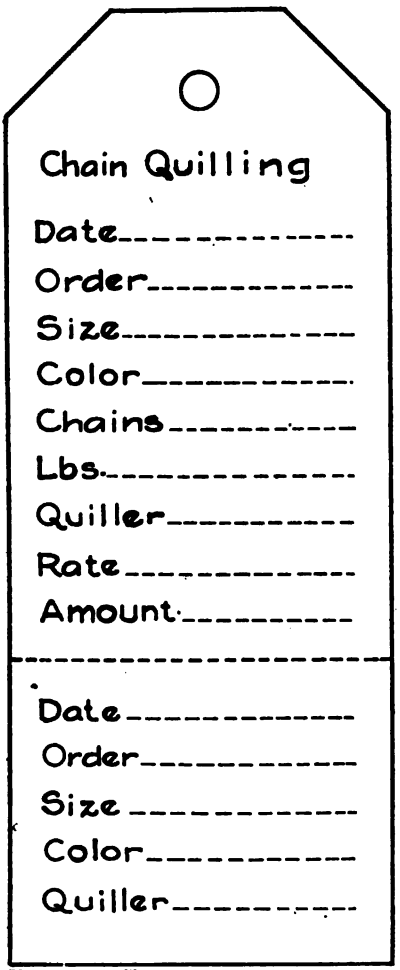
is recorded. For the spooling operation this procedure can be simplified because in many instances this operation is compensated on the hourly basis. In this case the machine hour method as described for the spinning operations may be used and the cost of operations determined by apportioning the productive labor on a machine hour basis. Such a method, however, is not necessary for winding operations where the finished product can be conveniently weighed and recorded. A record, as illustration (Form 95), has been designed to provide the

Mark		Size		Case No.		Location		Opened	
Gross Lbs.		Tare Lbs.		Net Lbs.		Shrinkage Lbs.		Shrinkage %	
Date	Lbs.	Date	Lbs.	Date	Lbs.	Date	Lbs.	Date	Lbs.
Totals									
Total Weight									

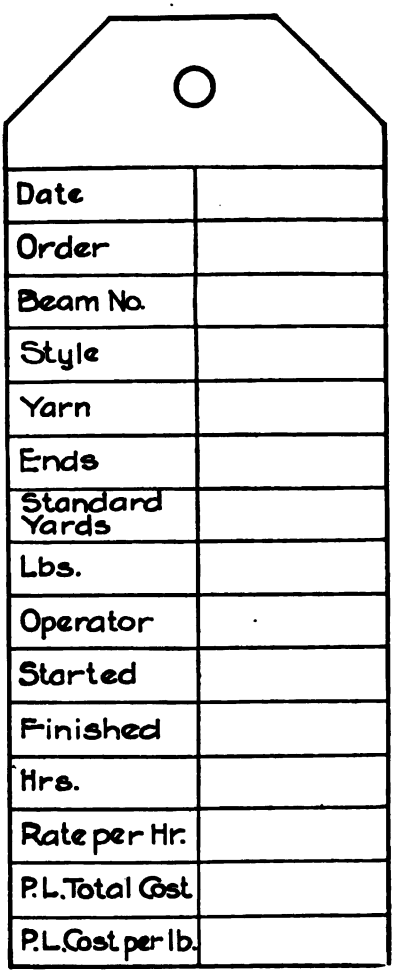
Form 96. Shrinkage Control Record for Outside Yarn Purchases

management with information on the efficiency of the individual workers, also to serve as an account with the operator, and as a basis for payroll. On this record the production of each lot or order number is recorded separately and in general the form represents the record construction of a plant where the operations are standardized to the highest practical degree. The shrinkages of yarns purchased on the outside should be controlled at this point. For weaving and knitting plants without a spinning division the checking of the shrinkage of

the yarn is of extreme importance which can be performed without much clerical labor in the following manner: When a shipment of yarn is received a case record, as illustrated in Form 96, should be prepared for each case, which record is to be maintained by the foreman of the winding department.



Form 97. Tag Control Record for Chain Quilling



Form 98. Tag Form for Cost and Production Record for Beaming and Slashing Operations

The record showing the original gross and tare weights to be kept in a file according to identification numbers. When a case is opened each withdrawal is recorded and when all yarn from the case has been used up, the record is sent to the office to be totaled and the difference between the original net weight and the total withdrawal weight will represent the loss through shrinkage while in stores.

Illustration (Form 95) is also suitable for recording quilling operations.

For chain quilling operation, a tag form of control is the most desirable. Such a tag should be prepared for each chain bale and when the lot is completed the lower part of the tag is left with the operator while the upper section is sent to the office where it is used for payroll and cost computations. Such a record is illustrated in Form 97.

The control of production of the warping, beaming and slashing operations is simple. While these operations are usually compensated on flat hourly payments, a control of production and the corresponding costs is possible because the product is usually in a convenient form to be measured or weighed without much labor. The distribution of costs can be based on the production per hour basis and a control conveniently maintained by the following simple system.

The orders for warping, beaming and slashing operations should be given to the operators on a tag order form as illustrated in Form 98. Such tags should show, besides the lot or order number, the necessary technical instruction for the product. It does not matter whether an individual works independently as for warping operations, or if there are several in a group as for the slashing operations, the control works equally well. When a new warp is started on any of the processes the date and time of starting is recorded on the proper production order tag. When the warp or beam is completed the date and time of completion is recorded on the

DRAWING RECORD

No..... Name..... Week Ending.....

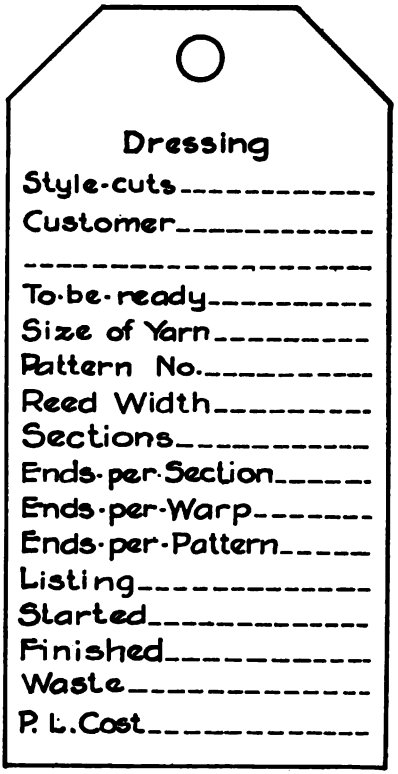
Order No.	Style	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total	Rate	Amount
Hrs.	Totals									

Form 99. Drawing Record Arranged for Showing Daily Production and Weekly Summaries

tag. This method of control is simple, effective, and requires very little clerical labor. These tags are sent to the office and at the end of the week the productive labor cost of that department divided by the total labor hours represented on these tags



Form 100. Cost and Production Control Tag for Woolen Spooling

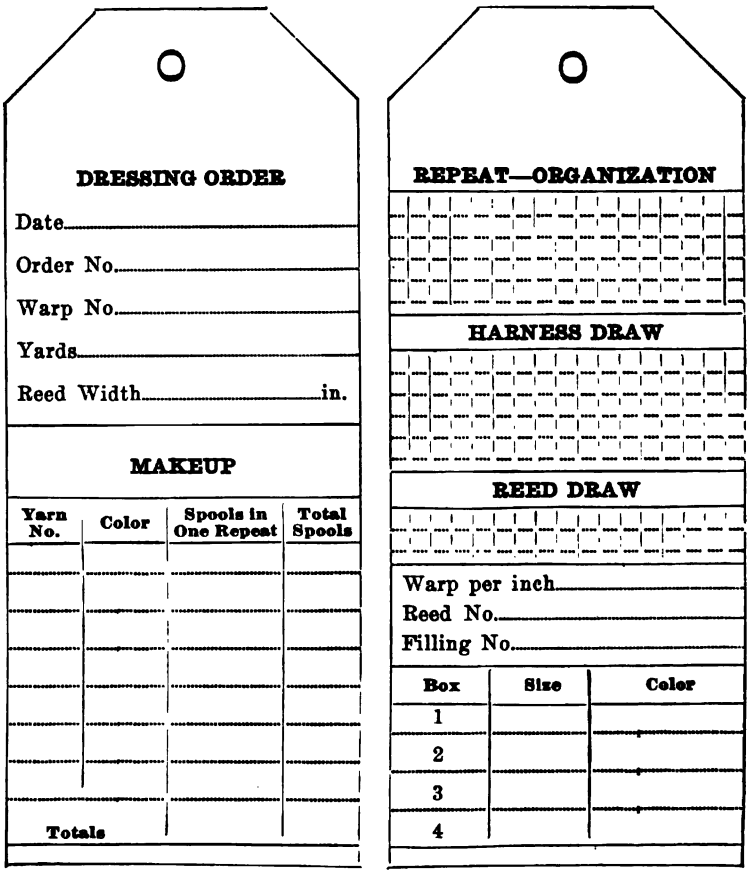


Form 101. Cost and Production Control Tag for Woolen Dressing

will provide the hourly rate of cost from which information the pound cost of beaming or slashing on any lot can be easily computed as shown in the following illustration.

Let it be presumed that in the warping department the total weekly payroll amounted to $250.00 while the total labor hours

reported was 288 hours. The rate per hour for that week for that department was 86.8 cents. If the production of 320 pounds of beams required five hours, the total productive labor



DRESSING ORDER

Date.....

Order No.....

Warp No.....

Yards.....

Reed Width.....in.

MAKEUP

Yarn No.	Color	Spools in One Repeat	Total Spools
Totals			

(Face)

REPEAT—ORGANIZATION

HARNESS DRAW

REED DRAW

Warp per inch.....

Reed No.....

Filling No.....

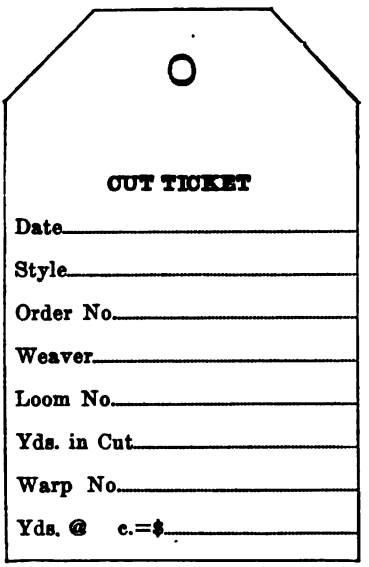
Box	Size	Color
1		
2		
3		
4		

(Reverse)

Form 102. Dressing Order for Multi-Colored Warps in the Woolen and Worsted Industry. In the Cotton and Silk Industries When Fancy Goods Are Woven Such Dressing Order is Essential

cost of that product will be $4.34 or 1.356 cents per pound. According to this method as described above, besides beaming and slashing operations in the cotton industry, the spooling

and warping operations in the woolen and worsted industry can be conveniently controlled. For the drawing and similar operations, a weekly record will prove the most desirable. Such weekly record is illustrated in Form 99, maintained for each operator. The arrangement of the record permits the direct registry of production according to definite orders any day during the week and the total cost of drawing for that order by a certain operator is obtained directly.



Form 103. Cut Ticket

In the woolen and worsted industries the preliminary operations such as spooling and dressing can often be controlled with simple control tags such as illustrated in Form 100 for spooling, and in Form 101 for dressing. In the former illustration the tag is divided into two sections, the upper remaining with the lot while the lower, upon its completion, is sent to the office where the cost is calculated and entered in the summary record. The latter illustration shows the dressing tag sent to the office as soon as the operation is completed. This method of control is exceptionally suitable for the felt and blanket branches where in many instances the warps must be prepared for special customers and the identification of these lots and the maintenance of the cost according to individual warps proves desirable.

For fancy suitings and overcoatings, where the warp dressers require careful instruction, the preparation of a Dress-

ing Order for each warp is desirable. Such Dressing Order Tag is shown in illustration (Form 102).

Control of Weaving Processes

There is no process in the industry that offers such a great variety of product as weaving. The operation of weaving is radically different from the spinning operations and therefore its control must be based on entirely different principles.

While the spinning operations represent a continuous process with hardly any division that will permit a direct measure of production, weaving in a unit process, and its production, and consequently its cost, is measurable in convenient units.

The cost control and production records of weaving are divided into three main groups.

Records of the production of weavers to form the base for payroll and direct labor costs.

Summary records to reflect the production of the whole department at convenient time periods.

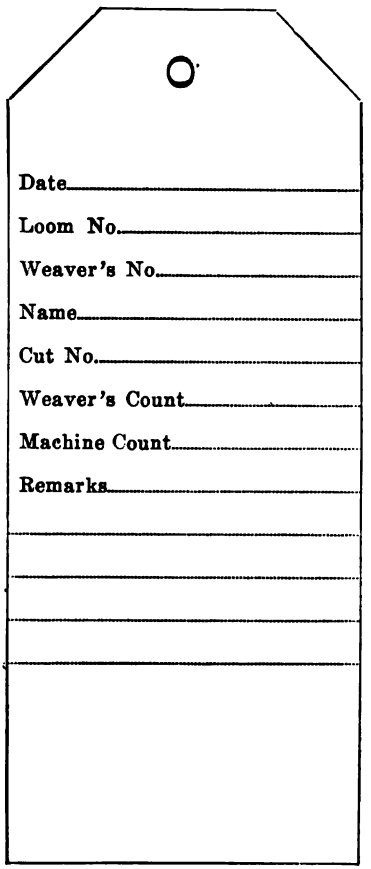
Control records of the waste and seconds.

The Records of the Production of Weavers

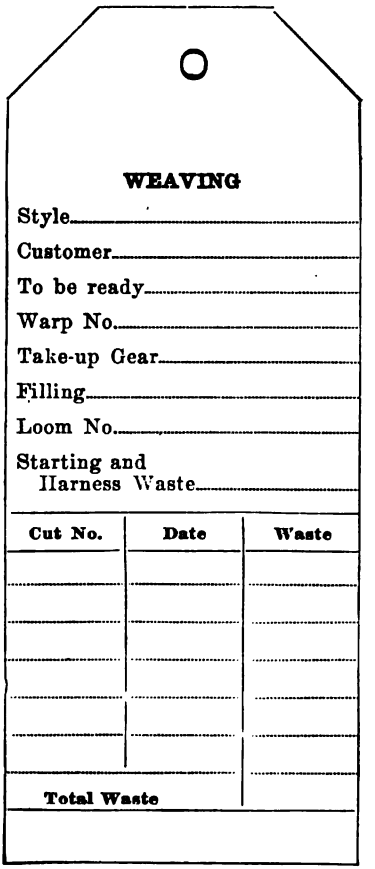
The records of production will vary with the article produced. The intensity of control must be in proportion to the value of the article. For the manufacture of print or tire cloth, for instance, it is probably sufficient to have the weaver's number and date of production penciled upon the cloth for the identification in the measuring department where the weaver is credited with the production, and from this point on, the identity of the cloth is lost. For fancy overcoating or brocaded silk fabrics such measure will not be sufficient. The nature of such articles demands that the identification be preserved, and therefore records must be provided for the purpose.

The almost universally adopted form of identification for

this purpose is a tag which will vary in size and construction with the requirements. Such tags are known as Loom Tags, Cut Tags, or Weaver Tags. A simple construction suitable



Form 104. Cut Ticket



Form 105. Instruction Ticket

for nearly all branches is illustrated in Form 103. With the exception of the yardage and cost computation the tag should be filled out in the weaving department when a cut is taken away, and the yardage of the cut entered at the measuring

machine. This ticket serves as a record for payroll and cost computation.

In mills where it is desirable or customary that the weavers also mark the yardage such cut tag may be designed to show both the weaver's count and the machine count, and a difference of measurement can be adjusted while the cloth is at the measuring machine, as illustrated in Form 104.

For a more complicated weaving operation such as fancy

Week Ending..... No.....
Name.....

Date	Loom No.	Cut No.	Yards	@	Total
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
Total Yards					.....
Bonus					.....
Pay for Week					.....

Form 106. Weekly Account with Weaver

suitings, multi-colored Jacquard work, etc., besides the weaver's tag as illustrated above, an instruction and control tag should be prepared as illustrated in Form 105. Such tag should give instructions for loom adjustment and filling and permit the recording of cut numbers, harness waste, weaving waste, or other necessary information.

In many mills, even today, the weavers are provided with

the old-fashioned memorandum books in which their production is credited and their pay computed. There is no objection to this simple and effective method. However, in a large plant it is desirable that the office preserve the accounts with the employes and this will necessitate the substitution of this simple system of accounting by a "Weekly Account with Weavers Record" shown in illustration (Form 106). Such records should always be made accessible to the weavers during the week so they can check their own accounts if they desire.

Name of Weaver .....

Loom ..... Qual. .....
Picks ..... Width .....
Cut No. ..... Yards .....

Time cut started .....

Premiums:
If this cut is woven in time
hours ..... cts. prem. per yd.
" ..... " ..... " .....
" ..... " ..... " .....

Time cut finished .....

Organ Lot ..... Tram Lot .....
Time allowed for extras: .....

Loss ..... Even ..... Gain .....

Form 107. Premium or Bonus Slip

In weave sheds where a bonus system or a premium system is in operation, the weavers should be provided with a record for each cut known as a premium or bonus slip. Such record arranged for a premium system is illustrated in Form 107. This record should be filled out for each cut showing whether or not the weaver is entitled to a higher compensation. In this manner many of the disagreeable controversies connected with such installations are eliminated and the success of the system assured.

Summary Records

Besides the above described individual production records in every mill, summary records are essential. The number and the construction of such records will depend upon the requirements, but in almost every plant some record should be maintained in which production can be summarized. Illustration (Form 108) shows a Daily Measurement Report de-

signed for a mill operating on three shifts. The size of such record will depend upon the requirements and serve as a daily report of total production.

For fabrics where each cut is examined, another form of summary, as illustrated in Form 109, is suitable, known as the Daily Examiner's Report. This record is arranged in such a manner that several styles can be reported on one record

DAILY MEASUREMENT REPORT

Measurer..... Date.....

Cut No.		Shifts I	Shifts II	Shifts III	Cut No.	
.....	Machine Count	.....	.....	.....	.....	Machine Count
.....	Weaver's Count	.....	.....	.....	.....	Weaver's Count
.....	.....	.....	.....	.....	.....	.....
.....	Weaver's No.	.....	.....	.....	.....	Weaver's No.

Form 108. Daily Measurement Report

and the production of each style determined at the end of the day without an extra analysis.

The record in the illustration is arranged for three different styles but it may be arranged to any convenient number, style, color, or design. Space is provided to register the quality of work for each cut. In standardized plants it is customary to express the quality of the work of the weaver by numerical symbols as illustrated:

Grade 1—Good
Grade 2—Fair
Grade 3—Poor

and the imperfections symbolized in a simple manner and marked at the same time as follows:

< Uneven
ff Double Filling
w Floating Warp
— Loose Ends
~ Poor Selvage
± Wrong Draw

DAILY EXAMINER'S REPORT

Examiner..... Date.....

Cut No.	Weaver	Style / Yards	Style / Yards	Style / Yards	Grade of Work
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....

Form 109. Daily Examiner's Report

This method of symbolization is simple and can be very easily taught to the examiners. Its recording requires little time and therefore the innovation is usually successful.

Loom Production Summaries

In many mills the management prefers to control the production on a loom unit basis and demands a daily report of production of the individual looms. The upkeep of such control records requires considerable clerical labor but in certain

organizations the information is worth the expense. The Production Report should be designed to give general information, such as production, weaver number, hours run, style produced and the causes for idleness or inefficiency. With such information a record is a useful instrument because it permits a good survey of departmental management and conditions. A record for such purpose, designed for use in connection with pick counters, is illustrated in Form 110.

WEAVING DEPT. PRODUCTION REPORT

Section 5 Date Sept. 10, 19 18

Loom No.	Weaver No.	Hrs.	Style	Day's Reading	Previous Reading	Pick Production	Picks Per In.	Yards	Notes
210	35	9¼	311/2	561,189	517,217	43,972	48	29	Changed Warp
211	36	9¼	311/4	715,003	663,792	51,211	48	34	
212	149	7½	311/2	119,359	88,149	31,210	48	20⅛	Loom Trouble
213	149	7½	311/2	72,857	40,789	32,069	48	21¼	
214					511,719				No Weaver
215					109,527				" "
216	113	9¼	314/1	657,998	636,679	21,319	48	14	Learner
217	113	9¼	314/1	431,347	412,232	9,115	48	6	"

Form 110. Daily Loom Production Report, Arranged for Production Control by Pick Counters

In certain branches of the industry it is desirable to maintain loom accounts for the production of each loom. Such a record is illustrated in Form 111 for conditions where the loom is continually on one style of fabric, while for a condition where the looms are changed to various styles of product, record Form 112 is suitable. The same record arranged for day and night work is illustrated in Form 113. These records have been designed so that the various styles produced during the month on one loom can be totaled without the necessity of an analysis. If a mill is standardized the efficiency of a department can be very well computed on the above records as

Section No. 2 Loom No. 15

Production Record of Month *September* 19 *18*

Date	Weaver No.	Hrs.	Style	Picks	Yds.	Notes
1	*7*	*10*	*1105*	*27152*	*27*	
2	*7*	*5*	*1105*	*12078*	*12*	
3						
4	*7*	*8*	*1105*	*21917*	*22*	
14	*7*	*10*	*1105*	*21719*	*21³*	*Change Warp*
15	*7*	*10*	*1105*	*29315*	*29¹*	

(Face)

Date	Weaver No.	Hrs.	Style	Picks	Yds.	Notes
16	*7*	*5*	*1105*	*10679*	*10²*	
17						
18	*7*	*10*	*1105*	*26317*	*26¹*	
29	*7*	*10*	*1105*	*22717*	*22³*	*Loom Trouble*
30	*7*	*5*	*1105*	*11566*	*11³*	
31						

Standard Hrs.	Productive Hrs.	Yds. Production	% Production
235	*212*	*416²*	*91%*

(Reverse)

Form 111. Individual Monthly Loom Production Report

Section No. 3 Loom No. 210

Production Record of Month September 19 18

Date	Weaver No.	Hrs.	Picks Production	Class of Goods-Yds. 311/2	311/4			Notes
1								Sunday
2								Labor Day
3	210	9¾	43,911	29				Changed Warp
4	210	9¾	51,210	34				
5	210	9¾	49,015		32			
14	210	4¼	20,045		13			
15								

(Face)

Date	Weaver No.	Hrs.	Picks Production	Class of Goods-Yds. 311/2	311/4		615	Notes	
16	210	9¾	46,784				30		
28	210	4¼	19,116				12		
29									
30	210	9¾	49,768				33		
31	210	9¾	47,332				31		
	Standard Hrs.	Prod. Hrs.	Totals for Month					Grand Total	% of Product
	244¾	244¾	1,147,213	63	241		557	848	100%

(Reverse)

Form 112. Individual Monthly Loom Production Record, Arranged for Control by Pick Counters

shown in the illustrations. Finally a yearly summary may be prepared similar to illustration (Form 114).

Production Record of Month *November* 19 *18* Section *31* Loom *1157*

Date	Day Production							Night Production							Total Yds.	Notes
	Weaver	Hrs.	Picks	Class of Goods Yds. 317	1105	1210	1411	Weaver	Hrs.	Picks	Class of Goods Yds. 317	1105	1210	1411		
1	715	10	54710		58			211	11	55132		59[2]			117[2]	
2	715	10	53913		57										57	No Night Weaver
3	715	5	21532		22[2]										22[2]	No Night Weaver
12																
13	315	10	52715			46[2]		211	11	51915			45[2]		92	
14	315	10	47070			41		211	11	50739			43		84	Loom Trouble
15	315	10	52313			46		211	11	53615			47[2]		93[2]	

(Face)

Form 113. Individual Monthly Loom Production Record, Arranged for Day and Night Production, and Control by Pick Counters

Date	Day Production							Night Production							Total Yds.	Notes	
	Weaver	Hrs.	Picks	Class of Goods Yds.				Weaver	Hrs.	Picks	Class of Goods Yds.						
				317	1105	1210	1411				317	1105	1210	1411			
16	315	10	54310			48^{3}		211	11	52456			46^{2}		94^{1}		
17	315	5	20843			21^{2}		211	5	20993			21^{2}		43		
~																	
30	315	10	59715				54^{2}								54^{3}	No Night Weaver	
31	315	5	23417				20^{3}								20^{3}	No Night Weaver	
	Stand. Hrs.	Prod. Hrs.	Totals for Month					Stand. Hrs.	Prod. Hrs.	Totals for Month						% Production	
																Day	Night
	250	250			167^{2}	515^{2}	544	275	123			59^{2}	511^{1}	175	1762^{3}	100%	45%

(Reverse)

Form 113. Individual Monthly Loom Production Record, Arranged for Day and Night Production, and Control by Pick Counters — (Continued)

Section No. 8 Loom No. 210

Production Record for the Year 19.18.

Month	Standard Hrs.	Running Hrs.	Class of Goods—Yds.				Total Yds.	% of Production
			31112	31114	530	615		
January	256½	197¾	619				619	84
February	218½	218½	608				608	100
March	244¾	238½	675				675	95
April	256½	211	210	436			646	90
May	256½	256½		627			627	100
June	244¾	227½			311		311	93
July	256½	256			294		294	100
August	244¾	244¾				675	675	100
September								
October								
November								
December								
Totals for Year								

Form 114. Yearly Loom Production Summary

Records for the Control of Waste and Damaged Product

In branches of the industry where the product is expensive, a systematic, detailed control of waste and seconds is essential. Suitable records must be designed to convey such information to the management in a simple and comprehensive manner. The filling waste can be effectively controlled with a record as illustrated in Form 115. This record is prepared for a daily collection of the waste. In many plants this is not necessary and the waste may be collected every second or third day, or even at the end of the week. The record is so constructed that the loom, kind of cloth, and the different grades or colors of waste may be recorded separately, and, therefore, without further analysis, the total waste produced and the value for each grade may be computed directly. Should a loom show excessive waste production, the causes can be investigated immediately and remedied.

DAILY FILLING WASTE REPORT

Section..... Date.....

Loom No.	Cloth	Size and Color of Yarn							

The other important cost item in a weaving shed is the loss sustained by damages to the product which will either make a piece a second or necessitate allowances to the customer. The control of this important item is neglected in many mills and the proper cost and control system should provide instruments which will give the management a comprehensive statement of such damages and provide dependable data for the computation and control of this cost item. The form designed for this purpose is a Weekly Report of Cloth Damages illustrated in Form 116, and is designed so that the causes of damages are tabulated and the number of damaged pieces or yards for each style of cloth recorded separately. This permits the knowledge of the exact amount of loss sustained through seconds and damages week by week, permitting good supervision and providing the office with dependable information on such cost factors.

In connection with the weaving department there is another record that should be discussed which, in many establishments, is badly neglected. This is a sample reference record. In many branches of the industry, and especially in the woolen and worsted industry, every season a number of samples are prepared. Records that show in detail how the samples have been made and what materials have entered into their construction should be maintained in every well managed mill. A suitable form for such sample reference record is illustrated in Form 117.

Records of Cost Control in the Knitting Industry

The knitting branch of the textile industry represents one of the most interesting cost control problems. This type belongs to the unit control production group but the groups are considerably smaller. While for the weaving operation the unit is one piece or one cut, in the knitting branches one to five dozens represents the production unit of control. A seem-

WEEKLY REPORT OF CLOTH DAMAGES

Allowances in Yards

Date.....

Damages	Styles of Cloth											Total
	A	B	C	D	E	F	G	H	I	J	K	
Uneven Colors of Warp												
Bad Filling Yarn												
Shady Filling												
Reed Marks												
Thin Places												
Dirty Tie-Ins												
Miss Picks												
Weave Room Stains												
Bad Weaving												
Seams												
Dye House Stains												
Washout Stains												
Mangle Stains												
Dryer Stains												
Oil Stains												
Thorn Selvedges												
Total Yards												
Value per Yard												
Total Value												

Form 116. Report of Cloth Damages

SAMPLE REFERENCE RECORD

Article	Date	Reference No. of Sample	Color
Warp Width	Woven Width		Finished Width

YARN

Warp No.	Twist	Batch Mixture	
" "	"	"	"
	"	"	"
Filling No.	"	"	"

WARP

No. of Ends	Beam Width	Selvage Size	Ends
Length Warp	Weight of Wrp.	Ends Jack Sp.	
Lbs. per Jack Sp.	Spooling Time	Beaming Time	

SETTING UP

Type of Loom	No. Harness	Drawing in
Reed Width	Ends to Dent	Weave of Fabric
Selvage Harn.	Weave of Selvage	Speed of Loom
Start. End	Drawing in Time	Setting up Time

WEAVING

Pick per In.	Take up Gear	Production per Hr.
Woven Width	Size of Cut	Speed of Loom
Burling Time per Cut		

SCOURING

Method	Time per Cut

DYEING

Time	Process	Formula

FULLING

Process	Time

FINISHING

Process	Time per Cut	Machine
"	" " "	"
"	" " "	"
"	" " "	"
Make up of Bolt		

Form 117. Sample Reference Record, Arranged for Woolen Industry

ingly difficult situation is created by the great variety of sizes which must be in proportion to the order requirements. It is impossible to discuss within the limits of this book the engineering features of the control and the discussion will be limited to the cost phase of the control.

Manufacturing costs in the knitting industry are usually figured for an average size. In determining such average sizes the management will find it worth while to give the variations of costs of the various sizes careful consideration and make sure that the average size selected for cost standard represents the actual average of the sale proportions.

In spite of the great variety of sizes and styles incidental to this branch the cost control of the product can be simplified to such an extent that it is free from red tape and yet accurate.

In this branch the cost of labor is relatively less important than the cost of materials. A knitted product made of a more expensive material may require a more elaborate finish, but the cost of labor will not be in proportion to the cost of materials. This emphasizes the importance of the control of material and waste. The management therefore should be provided, every week, with detailed data on waste and also on the seconds produced, while labor cost may be lumped departmentally. During the description of the cost control records for the weaving division, illustrations were given for reporting wastes and seconds under Forms 115 and 116. The same records can be easily reconstructed to serve any branch of the knitting industry depending upon the requirements and intensity of the control. Productive labor and other manufacturing costs can be controlled satisfactorily according to the following procedures.

The knitting industry is divided into three distinct branches as hosiery, underwear, and sweater manufacturing, and the control of each being slightly different they will be discussed separately.

Control Records for the Hosiery Industry .

The hosiery industry is divided into two branches, namely, seamless and full-fashioned. The control, with slight variations, is practically the same, and therefore the records illustrated herewith can be easily adjusted to serve either branch.

Winding Operations

Winding represents the preparatory operation in the knitting industry for which control records have already been illustrated under the section discussing the preparatory operations preceding weaving.

Knitting Operations

In the circular hosiery as well as in the full-fashioned branch there are two distinct knitting operations. In the circular branch the rib knitting and hose knitting, while in the full-fashioned branch the leg knitting and foot knitting. The cost and production of rib and leg knitting operations can be satisfactorily obtained with a record shown in Illustration (Form 118) known as a Rib Record. For each rib knitter such record should be maintained and the production recorded in pounds. This record should be sent to the office at the end of the week for payroll and cost computation purposes. It is so constructed that several styles may be recorded at one time and the production for each style totaled up at the end of the week without further analysis.

The cost obtained in this manner is an average cost which, in many instances, will prove satisfactory for the purpose. However, should there be an appreciable difference between the unit production of the various styles of ribs, adjustments should be made, based on the productive machine hours necessary for the production of the various styles.

The actual knitting operation in the seamless branch, and

WEEKLY RIB REPORT

Week Ending.....

Knitter..... No.....

Style	Style	Style	Style	Style
Total Lbs.	Total Lbs.	Total Lbs.	Total Lbs.	Total Lbs.

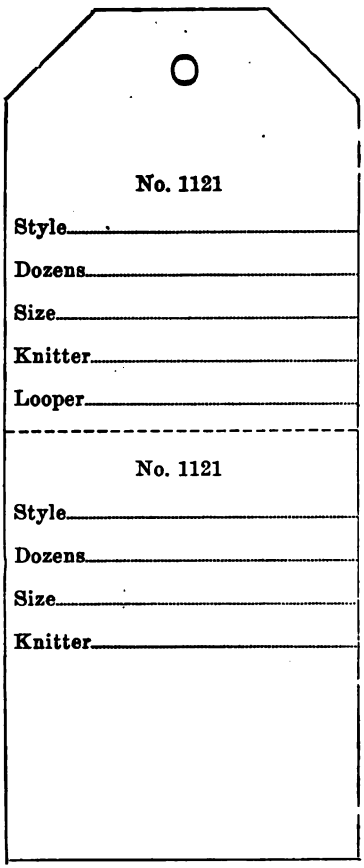
Total Hours..... Total Cost.....

Total Machines..... Cost per Lb.....

Form 118. Production Report on Rib Knitting

both knitting operations of the full-fashioned branch, are most conveniently controlled by the individual knitting tags shown in illustration (Form 119). Such tag is prepared for each unit order which will vary with the requirements of the mill. They are usually made out from one to five dozens. When the unit is completed the lower part of the tag is detached by

the knitter and, based upon this record, the knitter is credited with the production on an earning record, and then the detached coupon can be filed to be used as a base for the weekly cost and production computations. A suitable earning card is illustrated in Form 120, arranged in such a manner that for each style and size produced during the week, a separate column may be preserved and the production for each day recorded separately.



Form 119. Control Tag for Hosiery Knitting

While knitting labor is mostly compensated on the piece work basis, in nearly every knitting mill the employes are frequently paid on the flat hourly basis for special work, and receive a bonus or premium for extra performances. For this reason the earning record is so designed that all such excess payment can be recorded separately and the exact cost of labor for the various styles determined without elaborate calculations. Therefore it is not difficult to obtain the relation of the excess and bonus payments to the piece work on percentage basis, which percentage, added to the standard piece work rate, will represent the knitting cost for that operator for the week. Nor is it necessary that such additions to the piece rates be computed every week. In many

EARNING CARD

Knitter..... Operation..... Week Ending.....

Efficiency	
Current Period	Past Period

Hrs.	Style																	Piece Work	Productive Day Work	A Bonus	P Bonus	Learner's Excess	Non-Productive Day Work	Total	Deductions	Am't
	Size																									
	Rate																									
	M																									
	T																									
	W																									
	T																									
	F																									
	S																									
	Total																									

Form 120. Earning Record

mills it is sufficient to obtain the costs monthly in which case all excess payments are accumulated for the month and its percentage is determined on the monthly productive knitting labor cost basis.

PAYROLL TICKET

Operation..... Date.....
Name..... No.....

Style	Doz.	@	Am't.
Totals.....			

Form 121. Payroll Ticket for the Underwear Branch

The other operations in a knitting mill such as topping, looping, matching, boxing, etc., if compensated on piece work basis can be either recorded in the customary earning booklets, or on individual payroll records known as payroll tickets as shown in illustration (Form 121). One such ticket is maintained for each operator during the week and credited with the production. At the end of the week the records are sent to the office for payroll and cost computation purposes. In mills where an operator may be assigned to more than one operation, or to various styles for an operation, it is possible to record the production for each style separately by giving one payroll ticket to each style of work produced. In this way the production of a department, and cost, according to the various styles, is obtained without further analysis and a detailed report of production may be prepared which is very desirable for every mill. For operations where the employes are compensated on the hourly basis the same method of control is applicable, in which case such a record is known as a Production Ticket. Cost of operations can be very easily computed in this manner and any increase of cost will be known to the management. This control serves as a check upon the production of the individual operators and their skill or efficiency can be computed on this basis.

Another important feature of control needing attention is the change of sizes during operations. For instance, in a batch of stockings in a dye house the sizes may change. The management should know such changes not only to prevent their re-occurrence but also to adjust the production orders, otherwise a mill will soon find its shipping room overloaded with sizes not needed for the current orders, while the shipments are delayed for lack of sizes caused through such changes. The best method of control is the maintenance of a batch ticket for each dye batch when it leaves the gray room. Such batch ticket is illustrated in Form 122. This record should be sent

BATCH TICKET

Date.....

Style..... Color.....

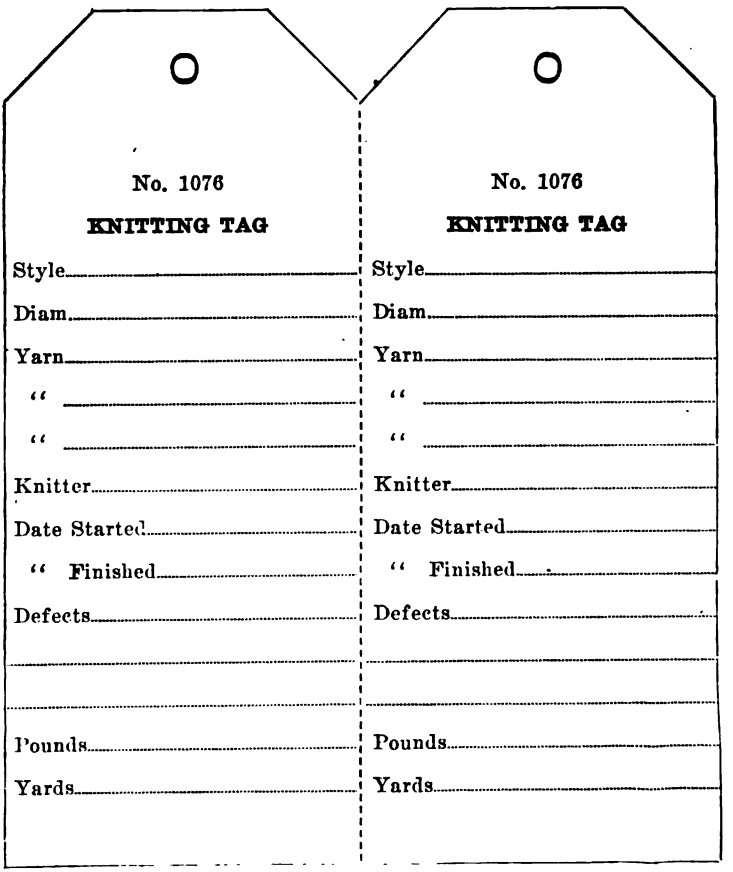
Size	Quantity	
	Gray	Boarded
Total Dozens...		

Form 122. Batch Ticket for Hosiery Dyeing and Boarding

with the batch to the boarding room and any change of sizes recorded. In this manner adjustments of the production orders can be easily made and a summary may be maintained for the control of this undesirable production feature.

Control Records of Underwear Knitting

In the underwear branch of the knitting industry the preliminary processes such as winding should be controlled in the same manner as for the hosiery branch.



No. 1076 KNITTING TAG	No. 1076 KNITTING TAG
Style	Style
Diam.	Diam.
Yarn	Yarn
"	"
"	"
Knitter	Knitter
Date Started	Date Started
" Finished	" Finished
Defects	Defects
Pounds	Pounds
Yards	Yards

Form 123. Knitting Tag for Underwear Knitting

The knitting operation can be most conveniently controlled by a knitting tag as illustrated in Form 123, made in two sections to permit the information to be recorded in duplicate. Such tag should serve as a production order and it should be attached to each roll of cloth before leaving that department. When a roll is started on a machine, the starting time, and when it is completed, the finishing time should be recorded on the tag, the weight of the roll, and defects recorded, one tag attached to the roll and the other sent to the office.

These duplicate tags are filed in the office and the knitting cost for each roll computed at the end of the week. This is possible by determining the number of machines the knitter ran during the week, and dividing his hourly rate by the number of machines. This hourly machine cost multipled by the time recorded for the completion of each roll will be the cost of labor for the roll. For instance, if a knitter's rate is 50c per hour, and he ran five machines, the hourly rate per machine is 10c. If the completion of a roll required twenty hours, the total labor cost of the roll is $2.00. By dividing this amount by pounds or the yards of the roll, the knitting cost per pound or per yard is obtained.

In most mills the cost of cutting is figured on averages which is not a satisfactory procedure. Cutting labor may be divided into two different groups. General cutting labor, including the handling of the rolls, and the laying out of the fabric, and cutting labor proper. The first group may be lumped into one sum and distributed on pound or dozen basis, while the latter should be determined for each style of article. Such record can be most conveniently maintained by recording the production of the individual cutters as shown in Form 124. This may be a daily or weekly record and the form may be reconstructed to show the cost of each lot separately or adjusted to serve as a summary of production.

CUTTING RECORD

Cutter..... Date.....

Stock	Style	Sizes												Waste Lbs.	Roll No.	Started	Finished	Cutting Time	Rate per Hour	Total Cost	Unit Cost
		32	34	36	38	40	42	44	1	2	3	4	5								

Form 124. Cutting Record for the Underwear Branch

Control of Knitting Finishing Operations

The almost universally adopted method of cost control for the finishing operations is the tag, one of which is illustrated in Form 125. While there have been many attempts made to eliminate such tags because they represent considerable expense, up to the present time no better method of control has been conceived. Such tags are made up of individual stubs representing each operation in duplicate. The tags are numbered and each number appears on each operation stub. According to the adopted procedure the operators, when the bundle of the tag is completed, mark their numbers on the tag and cut off the corresponding stubs as the check for their payments.

No. 41

Style_____ Size_____

Stich		Stich 41	
Neck		Neck 41	
Stay		Stay 41	
Face		Face 41	
Bind		Bind 41	
Hem		Hem 41	
Edge		Edge 41	
B. Hole		B.Hole 41	
Button		Button 41	
Tack		Tack 41	
Press		Press 41	
Fold		Fold 41	
Cut		Cut 41	

Form 125. Finishing Tag of Underwear Operations

At the end of the day each operator pastes the stubs on a sheet and sends it to the office for the computation of her pay. Such sheet, known as the Finishing Record, is illustrated in Form 126. On the illustration the piece rates for the operation are printed on the tag making the computation of the earnings simple. When more than one operation is performed by the same operator, a Finishing Record should be maintained for each operation.

FINISHING TICKET

Operator..... Date.....
Operation.....

B. Hole 46		8	B. Hole 73		6	B. Hole 75		10
B. Hole 46		8	B. Hole 73		5	B. Hole 73		10
B. Hole 46		8	B. Hole 73		6	B. Hole 75		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 73		6	B. Hole 75		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 73		6	B. Hole 70		10
B. Hole 46		8	B. Hole 73		6	B. Hole 75		10
B. Hole 46		8	B. Hole 73		5	B. Hole 75		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 73		5	B. Hole 70		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 73		6	B. Hole 73		10
B. Hole 46		8	B. Hole 75		5	B. Hole 73		10
B. Hole 46		8	B. Hole 75		5	B. Hole 75		10
B. Hole 46		8	B. Hole 73		5	B. Hole 75		10
B. Hole 46		8	B. Hole 73		6	B. Hole 70		10
			B. Hole 75		5	B. Hole 75		10
			B. Hole 73		6			

.....Dozens @ $..... =$.....
..... " " " ..... ="....
..... " " " ..... ="....
..... " " " ..... ="....

Total $.....

Form 126. Finishing Earning Ticket

There is another method of cost computation and control for the finishing operation, known as the Payroll Record. In this case the operators do not detach the stubs but the work is taken away from them by clerks assigned for this purpose who record on these payroll tickets the time, style, truck number, quantity, and rate, while the totals are extended at the end of the week in the office.

In a knitting mill there are a great many operations that are computed on the weekly payment basis. Such are the trimmers, boxers, ticketers, floor girls, etc., who must be considered as direct or productive labor. The distribution of such productive labor cost can be most conveniently made on percentage basis in relation to the total finishing labor cost. For instance, if it has been determined that the cost for such miscellaneous labor is 35% of the total finishing labor paid by piece work, the above per cent added to the finishing labor of each article will sufficiently and correctly distribute the labor cost for the department. The payroll for the mill should be arranged to record separately the various groups of day workers whether productive or non-productive labor. The proper form of payroll for such purpose has been illustrated in the previous chapters.

Cost Control of Sweater Manufacturing

The cost and production control of sweater manufacturing is similar to the underwear manufacturing, and nearly every record described above can be reconstructed to serve the needs of this branch.

In connection with the underwear and sweater industries it will be worth while to discuss briefly the importance of proper cost summary records.

Such summary records have been neglected in many mills, with the result that the cost of manufacturing was far above the approximate estimate. This fact was not known to the

management until the shrinkage of profits had taken such an alarming shape that a thorough investigation was necessary. An underwear or sweater plant should have for each style of

Style.....

COST ANALYSIS PER DOZEN

DESCRIPTION	
Body	
Sleeve	
Border	
Sash Belt	
Collar	
Cuffs	
Buttons	

MATERIALS

	Machine	Yards	Lbs. per dozen Silk			Lbs. per dozen Cotton			Sundries
Body									Buttons
Sleeve									Thread
Border									Boxes
Sash Belt									
Collars									
Cuffs									

Total Weight of Sweaters per dozen.

COST OF OPERATIONS

Knitting		Cutting		Assembling		Finishing		Boxing
Body		Body		CLOSING FRONT - BACK		CLEANING & TACKING		Examining
Sleeve		Sleeve		Borders		Pressing		Folding
Border		Pockets		Hemming		Under Pressing		Boxing
Sash Belt		Sash Belt		Collars, Cuffs		Side Loops		
Collars		Collars		COLLARS Over Stitching		Buttons		
Cuffs		Cuffs		Pockets		Tacking		
Steaming						Tassels		

Total Labor Cost per dozen

Form 127. Cost Sheet of Sweater Knitting Operation

product, a detailed standard cost calculation and at least once a month a comparison of the actual costs to the standard costs should be made. Such cost analyses showing the costs and

	COLORS			STYLE								
Materials												
Art Silk lbs.												
Waste %												
Art Silk lbs.												
Waste												
Art Silk lbs.												
Waste %												
Cotton lbs.												
Waste %												
Cotton lbs.												
Waste %												
Cotton lbs.												
Waste %												
Buttons												
Thread												
Boxes												
Cost of Materials												
Labor												
Knitting												
Cutting												
Assembling												
Finishing												
Boxing												
Cost of Labor												
Burden %												
Seconds %												
Packing												
Freight & Insurance												
Selling Expense												
Discount												
Total Cost												
Profit												
Selling Price												

Form 127a. Cost Analysis of Sweater Knitting Operation

summaries of cost are illustrated in Forms 127 and 127a respectively. The illustrations have been arranged for the sweater industry but a record for the underwear branch can be easily designed on the same principles.

No..... Week.....

Name.....

Dept..... Operation.....

	A. M.				P. M.				Time	
	In		Out		In		Out		Hrs.	Min
Monday										
Tuesday										
Wednesday										
Thursday										
Friday										
Saturday										
Sunday										

	Hrs.	@	Amount	
Straight Time				
Overtime				
Total				

Form 128. Standard Time Recorder Card

Production and Cost Control Records of Finishing Operations

Under finishing operations it is usual to classify all converting processes comprising the final manufacturing stages in the industry.

The finishing operations of cotton products are necessarily carried on on a large scale necessitating a control system not too detailed but rather of a summary nature. The method of payment for the operations with the exception of the final processes is usually based on the hourly rate, and to obtain the cost factors the office must have dependable records of the labor cost of the various departments.

A very simple and effective control of the proper labor cost is maintained with the assistance of an ordinary time register clock. There is hardly a plant where this simple and efficient method of registry could not be applied. The usual time register record is illustrated in Form 128. In finishing plants in general it is often necessary to shift labor during the day or during the week from one department to another, and unless a close record is maintained of such shifts the departmental labor cost and the actual cost of manufacturing of a process cannot be established. The following method of control is recommended for this purpose. The regular time recording cards should be ordered in several colors, one for each department, and every time an employe is transferred from one kind of work to another he should ring out on the time recorder when he leaves that department, and ring in the time in the department to which he has been transferred. In this way a dependable and simple record of labor transfer is maintained.

The payroll record for finishing plants should be arranged so that departmental labor charges as obtained from the individual time records can be analyzed at the time the payroll is prepared, and the proper labor charge for each department

PAYROLL AND PRODUCTIVE LABOR ANALYSIS FOR WEEK ENDING.....

					Operation		Operation		Operation		Operation		Operation		Operation		Operation	
Number	Name	Hrs.	@	Amount	Hrs.	Amount	Hrs.	Amount	Hrs.	Amount	Hrs.	Amount	Hrs.	Amount	Hrs.	Amount	Hrs.	Amount
Total for Week																		
Total for Week per Hr																		

Form 129. Payroll Analysis Record

thereby obtained. Such payroll record suitable for a direct analysis is illustrated in Form 129.

PRODUCTION ORDER

Customer No..... Date.....
Order No..... Shipping Date.....

Pieces		Cuts		Rolls	
Style		Color		Width	
Grey Cloth		Finish		Folds	
Wrapping		Ribbon		Label	

SHIPPING INSTRUCTIONS

.....

.....

(For Opening)
(Opening record attached to production order)

PRODUCTION ORDER

Customer No..... Date.....
Order No..... Shipping Date.....

Pieces		Cuts		Rolls	
Style		Color		Width	
Grey Cloth		Finish		Folds	
Wrapping		Ribbon		Label	

COMPLETED

Operation.....

(For all other operations)

Form 130. Production Order for Cotton Finishing Plants

OPENING REPORT

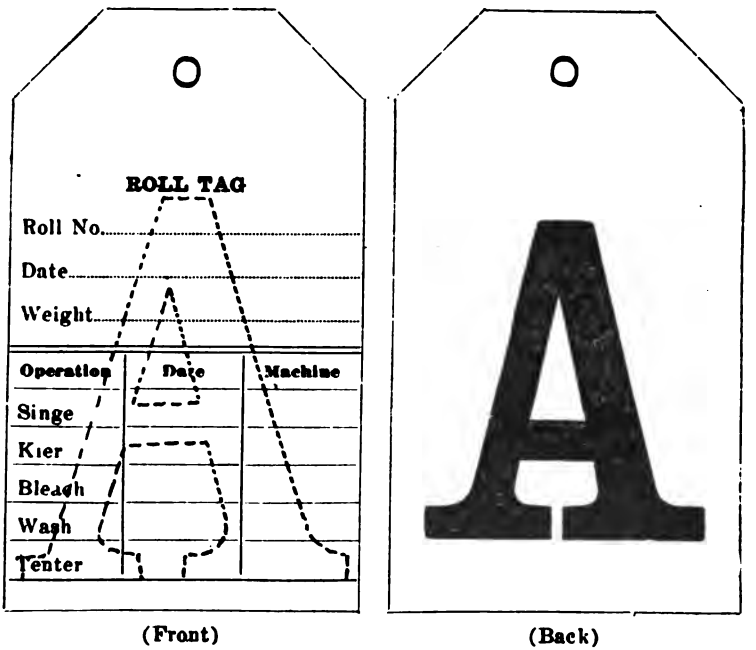
Order No.....
Style of Cloth..... Date.....

Bale No.	Pieces	Pounds	Total Yards	Roll or String No.	Weight of String or Roll

(Length of report depends on requirements.)

Form 131.. Opening Report for Cotton Finishing Plants

One interesting phase of the control of this branch of the industry is that during some operations the most convenient unit of control is the pound while during some other operations the yard, and finally during the wrapping and packing operations, the piece is the convenient measuring unit. This condition necessitates that the control records be arranged



Form 132. Identification Tag for Cotton Finishing Operations

so that the proper unit of the operation is available for the measurement of production without further computations.

The order to the mill for production should be given on a Production Order, illustration (Form 130). Such production order should contain all information necessary for the various departments and should be prepared in sufficient copies

to have a record sent to each department of the mill through which the goods must pass.

Method of Recording Production and Cost

Since the recording of the production must be either in pounds, yards, or piece, for the sake of simplicity of control a common measure must be provided as follows:

DAILY PRODUCTION REPORT

Operation..... Week Ending.....

Roll No.	Pounds	Yards	Style

(Roll number reported in plant.)

Form 133. Departmental Daily Production Report for Cotton Cloth Finishing Operations

One copy of the order must pass through the gray room where the stock is opened for the order, and the gray room will prepare for the office an opening report as shown in Illustra-

WEEKLY PRODUCTION SUMMARY

Operation..... Week Ending.....

Style		Style		Style		Style		Style		Style		Style		Style	
Lbs.	Yds.	Lbs.	Yds.	Lbs.	Yds.	Lbs.	Yds.	Lbs.	Yds.	Lbs.	Yds.	Lbs.	Yds.	Lbs.	Yds.

Total Labor Cost $..... Unit Labor Cost per Lb. $..... Per Yard $.....

Form 134. Departmental Weekly Production Summary for Cotton Cloth Finishing Plants

tion (Form 131). This opening report shows the style of cloth used for that order and provides a connecting link between the orders and the gray stock records. It will record all essential information such as bale numbers, number of pieces, pounds, and yards.

The formation of the rolls or strings takes place at the time of the opening and when a string or roll is completed it

Operation.....

Name..... No..... Week Ending.....

	Hours	Style	Quant.	Style	Quant.	Style	Quant.	Style	Quant.	Style	Quant.	Style	Quant.	Style	Quant.	Style	Quant.	Style	Quant.
Monday																			
Tuesday																			
Wednesday																			
Thursday																			
Friday																			
Saturday																			
Totals																			
Rate																			
Amount																			

Total Earnings $.....

Form 135. Earning Record of Piece Workers, Suitable for Cotton Cloth Finishing Plants

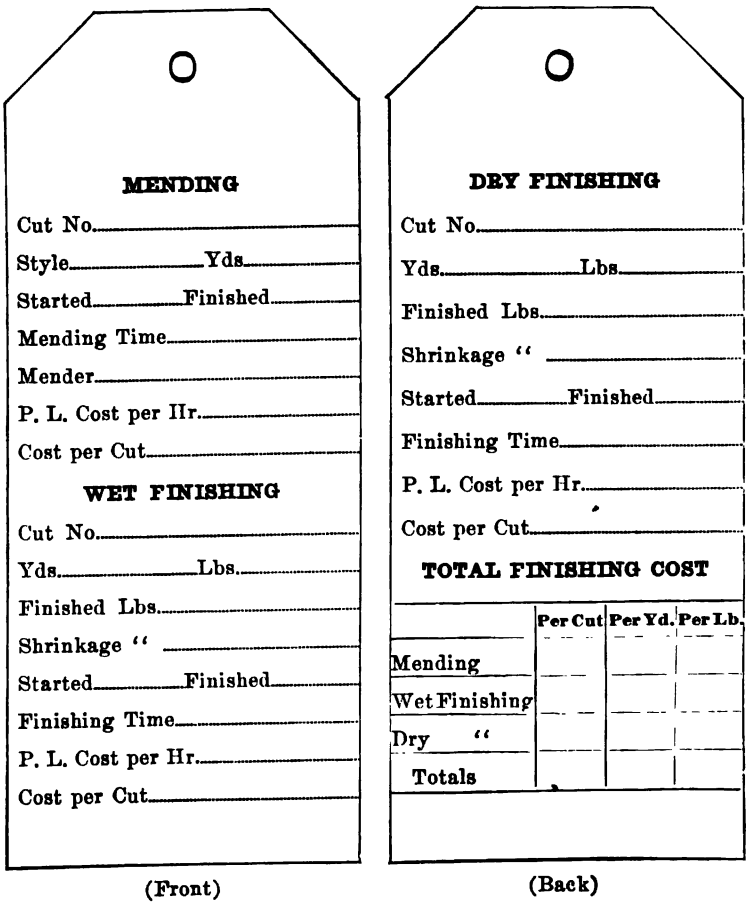
should have an identification number which, with the weight of the string or roll, is recorded on the opening report. This is sent to the office and attached to the original production order. In this way the office is provided with a dependable record of the materials opened for that order and information which will enable the identification of the roll during the manufacturing processes, and provides the proper record for the computation of manufacturing costs. This identification

REPORT OF MATERIALS USED

Dep't..... Week Ending..... ...

MATERIAL	QUANTITY	FOR STYLE

number should be marked on the roll, and in the opening room a roll tag should be prepared, illustration (Form 132), and sent to the first department through which the roll must pass.



Form 137. Finishing Tag for Wool and Worsted Finishing Operations

In large establishments where there is a great variety of processes an easy method of identification is to symbolize the processes with a letter. The opening room should have an

index of these process symbols and they should stamp on each roll tag the process symbol as shown in the illustration which enables the following departments to sort the rolls, without much loss of time, according to the processes. When an operation in a department is completed, the date of completion and the machine should be recorded on the roll tag and forwarded to the next operation.

Each department should maintain a Daily Production Report, illustration (Form 133), and record on it the roll

NAME						NUMBER	
ADDRESS						UNION MEMBER	
DATE OF APPLICATION	AGE	MARRIED	CHILDREN	NATIONALITY			
WHERE LAST EMPLOYED		HOW LONG		TRADE			
REASON FOR LEAVING							
REFERENCES							
ENTERED OUR EMPLOY							
RATE PER DAY							
LEFT OUR EMPLOY	REASON						
ABILITY		HABITS	CHARACTER				
Form 256 500-1-29-14							

Form 138. Employe's Control Records

number that passed through the department. In the office, with the assistance of the opening reports, the other necessary information such as pounds, yards, and style number is added.

At the end of the week the office should prepare, from the daily records, a summary for each operation according to styles, and this summary, illustration (Form 134), with the weekly labor cost analysis of that department, will provide the basis for labor costs.

To assure the correct distribution of cost the division of

operations should be based upon the speed of the machines or, in other words, the cost will be based on the machine hour basis.

The final operations such as folding, stitching, banding, etc., which in many plants are compensated on piece work basis, the production records are most conveniently maintained on a form as shown in illustration (Form 135). For each employe on these operations such record should be maintained for each week, and at the end of the day the styles and quantities produced entered by the overseer or the clerk of that department. The information obtained in this manner will serve for payroll and cost purposes and in construction is suitable for almost any finishing operation in this branch of the industry.

The raw materials in this branch consist of a large number of items which must be controlled according to the principles as described for the chapter on Material Control. Each department should, at the end of the week, submit to the management, a record of the materials used during the week and for what style of product. This record, illustration (Form 136), will form a basis for the proper distribution of material costs.

For the finishing operations in the woolen and worsted industry, the unit is usually one cut. Generally the cut number and other information of identification is sewn at the end of the cloth and for each cut a finishing tag, illustration (Form 137), should be prepared. The tag should travel with the cloth to the various finishing departments and it is designed to record all information necessary for the computation of the finishing cost. The customary divisions are mending, wet finishing, and dry finishing. For the mending operation the mender should record on the tag the starting and finishing times and her number or name, from which information the mending cost for the cut can be determined when the cut is

FORM 10

Name No.

Address Tel.

Living with

Family condition Age

Date entered employment

" terminated "

Reason

Relatives available for employment

Comments on service

WEEK OF	TOTAL HOURS	Productive Efficiency	Total Earnings	Unit Earnings per Hour

Form 139. Employe's Control Record Giving Weekly Earnings and Efficiencies

finished. The wet finishing operations usually consist of fulling, washing, and drying operations, and on the record referring to this department the fulled weight should be recorded from which any shrinkage of the cut that occurred during this process is determined. The starting time of the first operation and the completing time of the last operation should be recorded and the cost determined by dividing the total production labor cost for the week by the number of cuts finished during the same period.

The dry finishing operations usually consist of dressing and shearing for which the control procedure is the same as described for the previous operations.

In the past several attempts have been made to figure the cost of finishing for each cut by recording the detailed time for each operation. Experience has proven that such detailed cost records are both expensive in upkeep and the results obtained are far from compensating for the effort and clerical labor. Finishing, by nature, is a group operation and its elaborate control will not bring better results than a group control on lines as described above.

General Control Records

This completes the description of the record requirements of the textile industry. It would be impossible to describe in detail all the records and their construction covering every possible condition. The purpose of these records is to present one solution and provide the reader with a starting point for construction of suitable records.

However, there are a number of auxiliary records that should be maintained in every well-managed plant because there are certain phases of management which, while not directly connected with the cost control, are supplementary to a well-organized system.

Every mill should maintain records of the employes, the

MACHINES OUT OF ORDER

Date.....
Dep't.....

MACH. NO.	MACHINE	REASON	HRS. IDLE

DEPARTMENTAL REPORT OF DELAYS

Dept._____ Date_____

Order No._____is Delayed

Since_____M

Last Completed Operation No._____

Cause_____

_____

Work Will Be Resumed _____

_____

Any delay expected to last two hours must be reported.

Form 141. Department Report of Delays

REPORT OF WORK RESUMPTION

Dept._____ Date_____

Order No _____

Work was Resumed at_____M.

On Operation No. _____

Delayed Since_____

_____

Form 142. Report of Work Resumption

size and construction of which will vary in proportion to the requirements. Two forms of employe's records are illustrated in Forms 138 and 139. The former is a short history of the employe, while the latter records the weekly attendance, efficiency and earnings.

Delays of production should be known to the management because delays will increase the burden cost, and proper

QUESTION SLIP

Date_____

Form 143. Question Slip for Interplant Communications, Also for Tickler System

reports will enable the management to act for its prevention. One form extensively used, known as Out of Order Report, is illustrated in Form 140. In this the machine number, the reason for stoppage, and the idle time is recorded.

It is often desirable that delays of operations be reported to the management. Illustration (Form 141) shows a form known as Departmental Report of Delays, and illustration (Form 142) a form of Report of Work Resumption.

Inter-departmental communications should be made in a written form whenever such communication is of importance. One form of such communication slip known as a Question Slip is illustrated in Form 143. This may be arranged as the tickler system to be filed to follow up at the proper time. In mills where a large number of details must be executed by certain individuals and upon whose discretion the proper

CONSCIENCE FILE

Form 144. Conscience File

execution of certain details depends, a record as illustrated in Form 144 known as a Conscience File may prove successful. Many a lot of odds and ends of material that could be used up but were neglected were finally disposed of by providing the individual upon whose conscience the use of such materials depended with the conscience file giving the details of the materials to be eliminated. In the same manner machines that need periodical inspection and are never inspected under

ordinary control will force attention through the conscience file. The file may be arranged according to months and dates similar to the tickler system to bring the various individuals' attention to certain business at the right time.

In the underwear industry many seconds are produced through the carelessness of the employes who lay out the



Form 145. Warning Ticket

cloth for cutting. A Warning Tag, as illustrated in Form 145, printed on a red background will call the attention to imperfect stock of even the tardiest of employes.

The above illustrated material will probably be sufficient to suggest the use and construction of records. While not strictly cost control, nevertheless it is desirable information for the management.

CHAPTER XVIII

COST WITHOUT RED TAPE

What is the reason that such an important industry as the textile industry still lags behind in modern cost and control developments and that only a comparatively few concerns have dependable detailed records of the cost of manufacturing? The reason for this state of affairs can be found in several directions.

1. The lack of realization of the importance of the knowledge of manufacturing costs.
2. The complicated construction of the majority of cost control systems.
3. The cost of upkeep of a complicated cost control system.

The first cause is gradually eliminated. The industrial changes of the last few years have brought even the stanchest supporters of the old-fashioned rule of thumb system to the realization that the control of costs cannot be maintained by a hit and miss method if the enterprise intends to stay in the race. Cost of manufacturing nowadays needs a careful analysis and the cost records should accurately reflect the conditions immediately, otherwise the anticipated profits will probably turn into a loss.

The other difficulty that stood in the way of the progress of cost control in the textile industry was the complicated nature of the cost system forced upon the industry in the past. These complications commence usually with the attempt of the distribution of the costs. This is wholly unnecessary. Ac-

cording to the theory of the interrelation of the control accounts, which is easily understood by everybody, if the proper method of distribution of a cost factor has been established, the controlling machinery of the cost accounts will work with smoothness and precision. The difficulty commences when the summaries of the cost factors as reflected by the control accounts are ready for distribution among the manufacturing processes and the various articles manufactured during the period of the control.

The distribution of the costs as defined above, according to the analytical method of cost computation requires the upkeep of such a multitude of detailed information that it will surely discourage the average manufacturer. How can such detailed analysis be performed without the necessity of undue clerical labor and heavy expense? It is clear that every change of labor cost, short time, partial operation and efficiency of production will affect the cost of manufacturing and the so-called red tape in cost systems and the multitude of clerical labor is caused by the necessity of the detailed upkeep of records reflecting the above changes. This method is known as the analytical method of cost control.

The trouble with the analytical detailed cost control is that it looks at everything from the accounting point of view and attempts a painstakingly correct summary information but does not provide a common measure of comparison. A carload of coal is measured by a standard measure—the ton. The analytical method of cost accounting, however, does not follow this common sense procedure but, figuratively speaking, compares one carload to another by volume and demands the counting of the lumps of each carload.

Nobody will deny that the simplest and least expensive and quickest measure of coal is the standard ton.

The items of cost of manufacturing are but magnitudes expressed in figures and if coal can be measured simply and

effectively by comparison to a standard, each item of cost of manufacturing can also be measured in the same manner by standards.

If time, cloth, cotton, nautical distance, radiation, stress, potentiality—each representing a different thing—can have a standard measure of comparison, is there any reason why standards cannot be developed for measuring cost? With such standards correct manufacturing costs can be obtained in a simple manner that will do away with the elaborate and expensive analytical method.

We know that time is one factor that will always enter into the cost of manufacturing and that time is constant because there are always sixty minutes to an hour. Therefore time is one factor which can be utilized as a standard measure for the cost of manufacturing.

One hour, therefore, is a cost standard. By combining this measure with a machine we will obtain a standard measure by which any operation in a plant may be measured. For a cotton spinning plant, for instance, we will have,

Card hours
Roving frame hours
Spinning frame hours
Spooling frame hours
Etc.

For weaving operations

Beaming hours
Slashing hours
Weaving hours
Etc.

For knitting operations

Knitting hours
Buttonhole making hours
Boxing hours
Etc.

Another standard measure that can be determined is the number of units of a product a machine can produce. This measure is known to every manufacturer as the practical efficiency of a machine. If a card can produce of a certain stock and grain, 30 pounds an hour, the standard cost of that particular sliver will be the standard labor cost for running a card for an hour divided by 30.

Therefore, labor cost can also be standardized and applied as a standard measure. Piece work is nothing but a standard rate per hour expressed in terms of unit production. This being the case any kind of labor, either productive or non-productive, can be expressed in its relation to a machine hour.

For instance, carding is almost universally compensated on hourly or day work basis. There are a number of occupations such as card tenders, strippers, carriers, etc., necessary for the operation of a carding department. The complement of such employes essential to man a department running at full capacity is designated as the standard complement of labor of a department. Disregarding the fluctuations of the labor market there is a standard rate by which these employes are usually paid and by listing the number of the employes at such standard hourly rates for a full week and full equipment, a standard departmental labor cost per week, either productive or non-productive, is obtained. This is a standard measure.

As has been mentioned previously, production can be measured by an hour's production of a machine. In a carding department one card represents 48 card hours per week, ten cards 480 card hours, etc. Let it be presumed that in a cotton mill the standard carding productive labor cost as explained above amounted to—for a 48 hour week—$109.44, and the standard card hours for a 48 hour week amounted to 1,368 card hours. Therefore, the standard carding labor cost per card hour was eight cents.

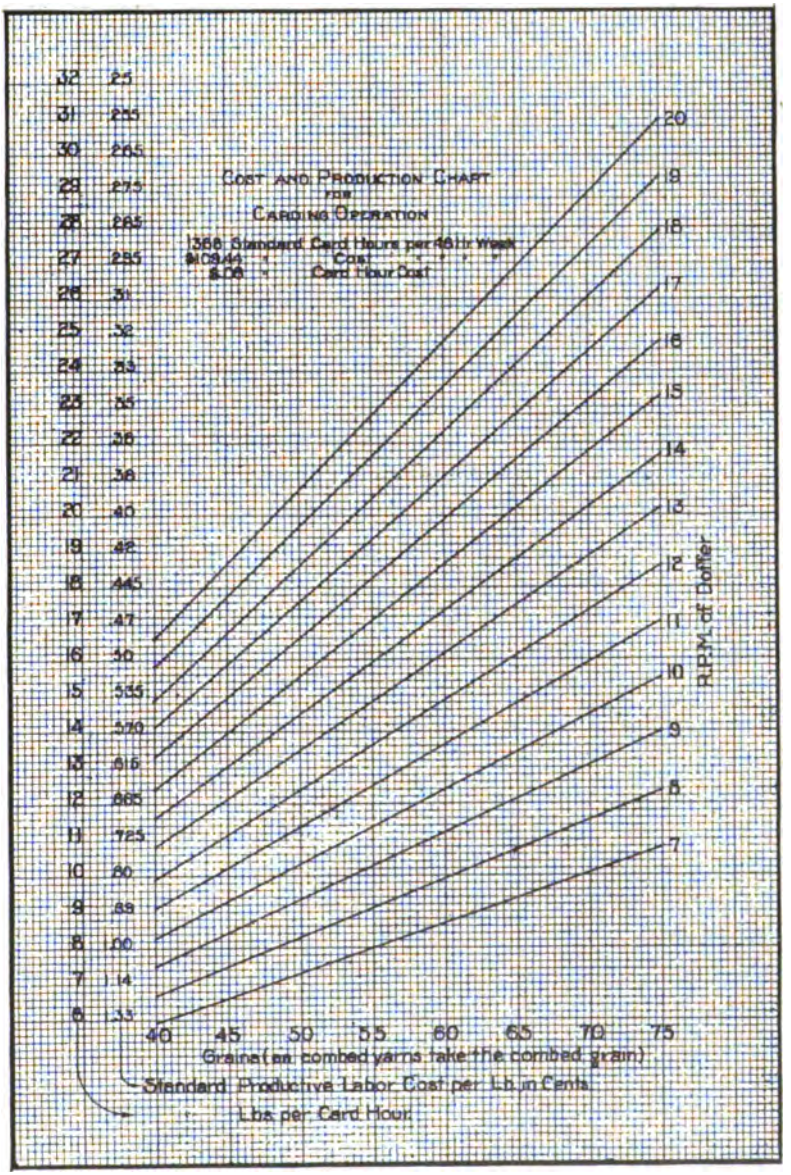
Now, if of a certain grain of sliver the standard production of a card is eight pounds per hour, at eight cents, which is the standard cost per card hour as explained above, the standard labor cost will be one cent per pound.

These are the standards by which the production can be measured without red tape. Such standards are capable of graphic representation, or in other words, can be charted no matter what the manufactured article is. With the assistance of such graphic charts the above information can be determined without elaborate calculations.

Construction of Charts

Such a standard cost and production chart, illustrated in Form 146, for carding operation is constructed in the following manner: The standard practical production of a card is equal to the theoretical production, less the allowance for all normal delays such as stripping, grinding, etc. Such standard for carding must be determined for the various doffer speeds because the production and the speed of a card will depend upon the stock carded. This production is expressed in pounds of one card hour. The co-ordinates of the standard production chart are divided in the following manner:

On the bottom of the chart the grains of sliver are recorded on a corresponding scale so that the resultant graphs will provide the information not for one or two different grains, but for all the possible sliver grains that may be required in that organization. On the left side of the chart a scale is provided representing pounds per hour in suitable subdivisions. The standard production of a card for a certain doffer speed and for a certain grain of sliver is now recorded by following the line vertically representing the proper sliver weight until the point is crossed by the horizontal line that represents the standard production per hour. After sufficient points have been located in such a manner the direction of the graphic line



Form 146. Cost and Production Chart for Carding Operation

is known and extended. For the carding operation this is repeated for each possible doffer speed. For instance, let it be presumed that for a forty-five grain card roving, the standard production at 7 doffer revolutions is 6.6 pounds, for fifty grains, 8 pounds, for sixty grains, 8.5, etc. These standard productions are represented on the chart by points in which the intersection between these two standards is designated by a point and connected in a continuous line. It is only natural that the point between these two definite measures must be in proportion and therefore such line represents the standard production of the product no matter of what grain construction, and this can be read off without difficulty.

Since the standard production per card hour and the standard cost per card hour is known, the cost per pound of the product for any construction is determined by dividing the standard cost per card hour by the standard production of the card hour, resulting in the standard cost per pound as shown in the second left scale on this chart. In this manner it is obtained, by following the illustration, that the standard productive labor cost for fifty grains roving at 11 doffer revolutions per minute is .709 cents per pound.

In the same manner the cost of any operation, and therefore any phase of manufacturing cost can be obtained.

In many branches of the textile industry, the non-productive labor, while forming a burden item, nevertheless, should be shown separately from the other burden items. For instance, in a spinning mill each department has a large list of departmental employes which cannot be charged to productive labor yet the management should control the efficiency of such labor because they represent an important cost item, and its efficient utilization should be enforced by proper control. Such labor may be departmental burden such as section hands, roving carriers, band boys, etc., or general such as overseers, elevator men, etc. The above standardized

graphic method permits the control of such an item directly and in a simple manner. Using as an illustration the carding department of a spinning plant, such general burden labor is usually distributed for the carding department at the final roving operation, while each department, including the roving department, will have a burden labor cost that should be figured separately.

Now this standardized graphic method of cost control may be used to obtain the standard costs simply and directly as illustrated in Form 147.

According to this chart the conditions in that plant were as follows:

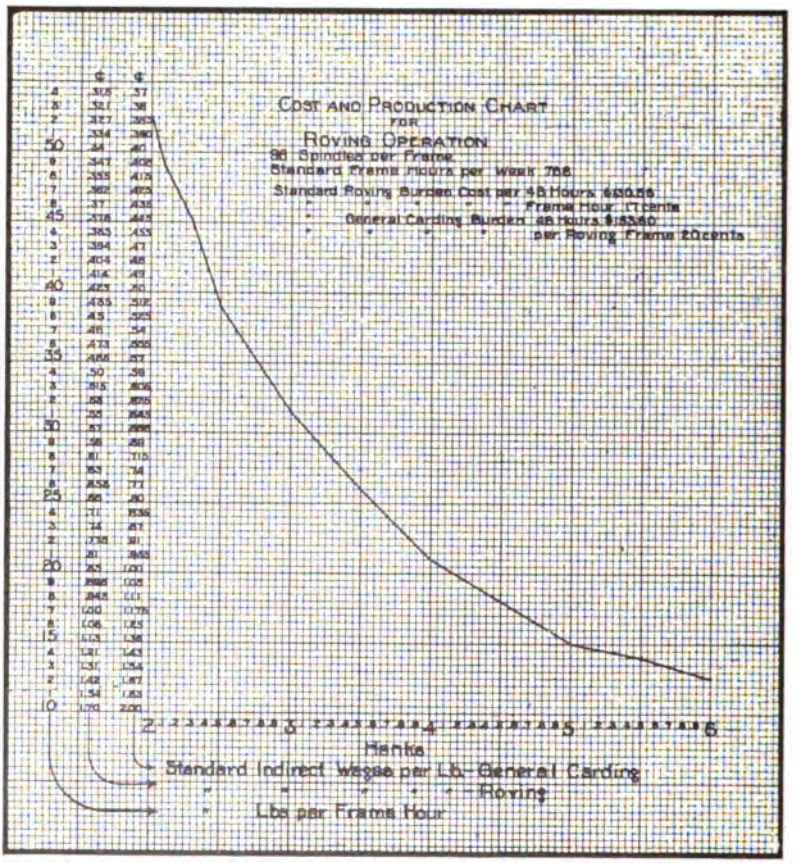
The roving frames had 96 spindles per frame, with 768 standard frame hours per week. Standard Roving Burden cost for 48 hours was $130.56. Standard Roving Burden cost per frame hour 17 cents.

General Carding Burden to be distributed on the production of the roving department for 48 hours was $153.60. General Carding Burden per roving frame hour—20 cents.

Based on the standard production of a frame hour and according to the principles as explained in the previous illustration, a chart was developed that shows the standard production per frame hour, the standard indirect wages or burden wages for the roving department, and the standard indirect wages or burden wages of general carding according to each hank roving. For instance, according to this table the standard production per roving frame hour for a number four hank roving is 21 pounds per hour, and the standard indirect wages for number four hank roving is .81 cents per pound, and the standard indirect wages for general carding for number four hank roving is .955 cents per pound. In this manner the standard cost is obtained for any hank of roving in a

fraction of a minute without further computation by looking up the table.

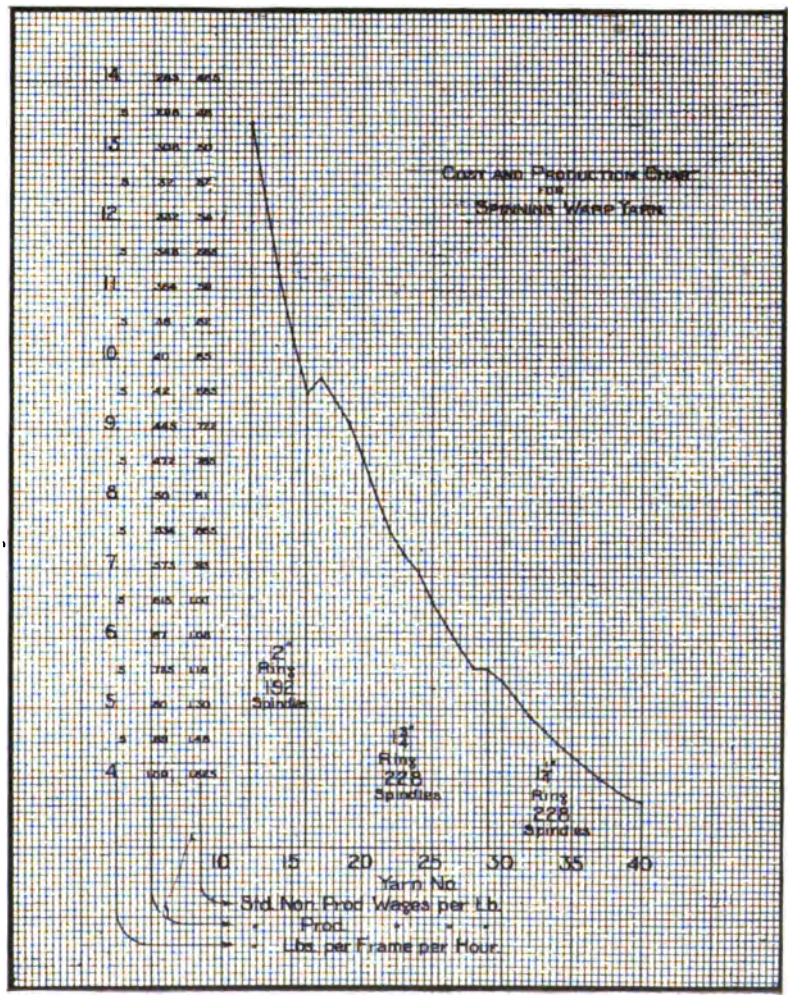
That this method is applicable for any operation is illustrated in Chart (Form 148), developed for warp spinning



Form 147. Cost and Production Chart for Roving Operation

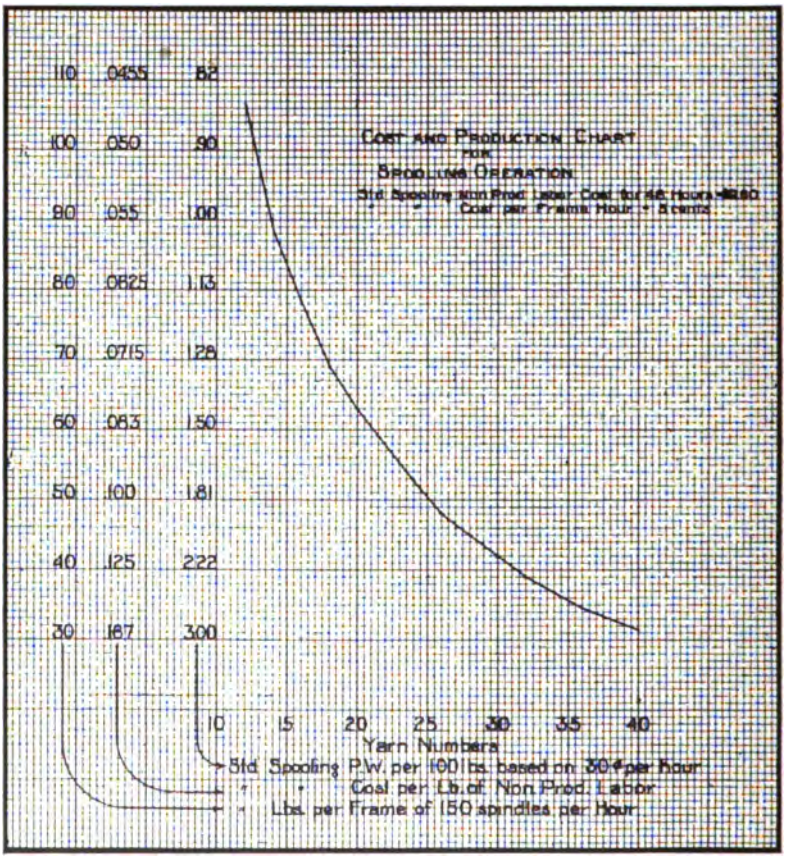
operation. This chart illustrates how both productive and non-productive labor may be obtained directly. The productive labor of spinning is usually paid by the number of sides a spinner is

serving. On this chart the standard productive labor cost for any size of warp yarn can be read off directly by following the line representing the yarn number until it is intersected by the curve. The second column on the left side represents the



Form 148. Cost and Production Chart for Warp Spinning Operation

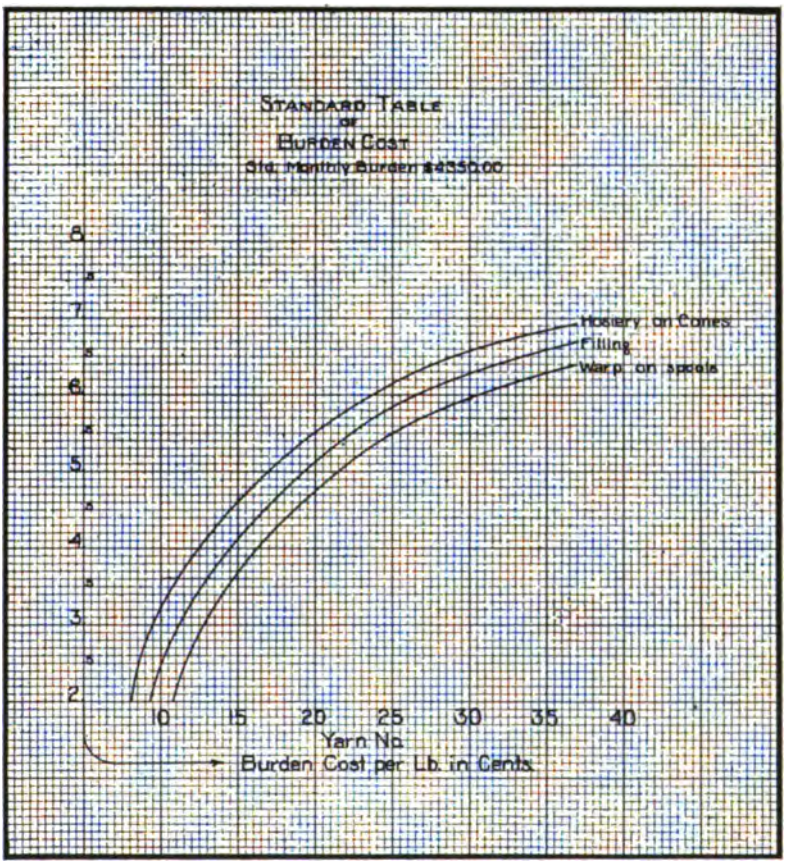
productive labor cost or the standard spinning labor cost per pound. Similarly the departmental non-productive labor is obtained in the same manner while the last scale represents the



Form 149. Cost and Production Chart for Spooling Operation

standard production per frame hour. A similar condition is illustrated in Chart (Form 149) representing the spooling operation.

Such graphic method of production and cost determination will assist in substituting the conventional tug of war method of piece rate determination by a simple, scientific, and



Form 150. Standard Table of Burden Cost

provable procedure. Sometime ago a mill worker having more than average intelligence told the writer that in a textile mill there are two kinds of piece rates—too high and too low.

In the first instance the worker puts something over the management, and in the second instance the management puts something over the worker. This is by no means an exaggeration. The average piece rate is but guess work based on biased opinions, the only question is who has the upper hand. If the rates are too low, production and quality will suffer. If the rates are too high, production will suffer just the same because the mill worker is yet to be found who voluntarily went to the management to reduce the piece rates because they were too high. In the writer's experience there are numerous instances where workers have put themselves to almost ridiculous inconvenience to prevent a fair production because the piece rates happened to be too high. Such graphic charts never lie and tell at a glance what the proper piece rates should be in a manner beyond argument.

Standardized Graphic Control of Burden

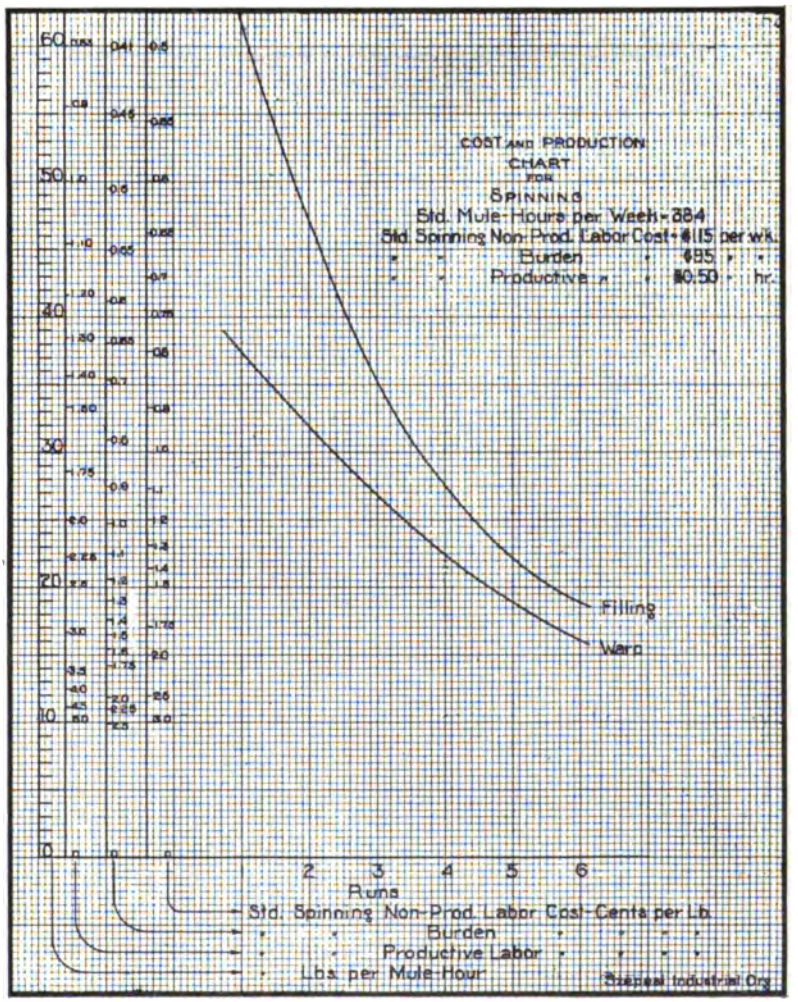
That the same method is applicable also for burden distribution is illustrated in Chart (Form 150) developed to represent the burden of a cotton spinning plant manufacturing warp, filling, and hosiery yarns. As explained in previous chapters, the burden is most conveniently distributed on the productive labor cost percentage of an article or on the machine hour cost which is the same thing in different terms. According to the above principles a burden chart as illustrated can be developed based on the relation of productive labor cost of an article and its proportionate burden, which is as the total productive labor is to total burden.

Advantages of the Graphic Standardized Method

Every manufacturer will realize the advantage obtained through this graphic standardized method. Productive labor cost, non-productive labor cost, departmental and general burden can be computed in a few minutes for any article

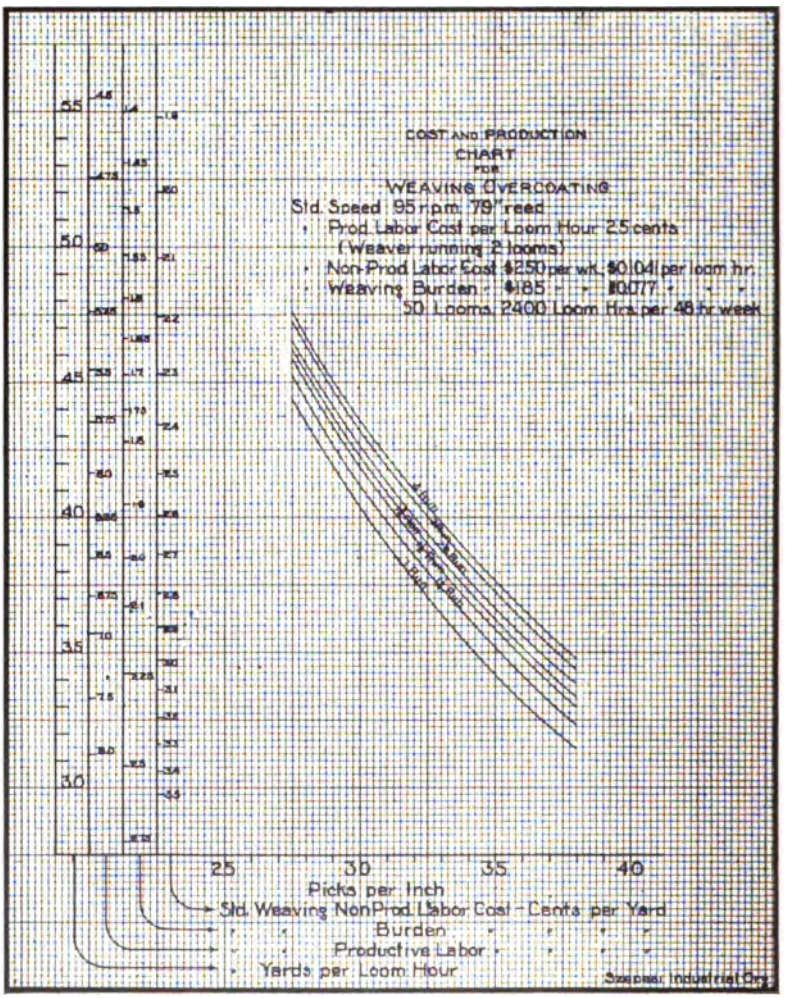
that has been manufactured or for an article for which only quotation is desired.

That this method is universal and applicable to any tex-



Form 151. Cost and Production Chart—Mule Spinning Operation

tile branch is illustrated in Charts (Forms 151 and 152). The former represents the spinning production and cost standards for a woolen mill for both warp and filling yarns, and the latter the cost and production standards for weaving overcoat-



Form 152. Cost and Production Chart for Weaving Operation

ings. This latter chart is so constructed that even if there is a change of size of a filling, and in the pick of the fabric, the standard costs can be obtained quickly.

How to Determine Actual Costs with the Assistance of the Above Charts

If the total labor or total burden for a department or a mill is greater or less than standard, the cost of every article will be affected proportionately. If the standard labor cost of a department running at full capacity is $100.00, and the actual labor cost is $110.00, the actual cost of labor for that week in that department is 10% greater than standard. Following this principle, any increase or decrease under certain conditions above or below standard cost or standard production can be determined and tabulated in such a manner that by knowing the amount of differences, the percentage of addition or deduction can be obtained without further computations.

Conditions that Affect Standard Costs

It is a well known fact to every manufacturer that a decrease of efficiency, idle equipment, or short week, will affect the cost of manufacturing independent of the increase or decrease of labor cost. What effect such changes will have on the cost of manufacturing is a very important question for the manufacturer. To determine such changes in costs by the analytical method would require not only an immense amount of clerical labor but the results would not be obtainable immediately and therefore such figures represent past history beyond correction.

The conditions that affect the cost of manufacturing are as follows:

A. Equipment working full capacity, full week, but total productive labor cost of department above standard.

B. Equipment working full capacity, full week, but total productive labor cost of department below standard.
C. Department operating full week but with some equipment idle.
D. Mill operating less than full week but full equipment.
E. Mill operating less than full week and with partial equipment.
F. Mill operating overtime with full equipment.
G. Mill operating overtime with partial equipment.

Any of the above conditions will affect the cost of manufacturing and to what extent such changes affect the operating cost of the plant and the actual cost of each article manufactured should be known to the manufacturer. This is the only information that can be used as a dependable guide for preparing quotations and comparing anticipated costs with actual costs.

By providing correction tables to show what addition or deduction should be made to standard cost, the actual manufacturing cost will be obtained quickly and without elaborate calculations.

The construction of such correction tables is not very difficult after its principles are understood.

Principles of the Construction of Cost Correction Tables

For illustration, let us presume the same conditions as for the development of standard charts, that is a cotton mill with ten cards working forty-eight hours a week; having therefore 480 card hours a week. This is the standard measure of time.

Similarly, the standard wages for the Carding Department are $48.00 per week, or the standard labor cost per hour for the carding department was $1.00.

Let us also presume that the mill produced three kinds of

roving, for which the standard production per hour has been determined as follows:

50 grains roving at 13.4 pounds per card hour
55 grains roving at 14.8 pounds per card hour
60 grains roving at 16.2 pounds per card hour

These are the standards of measures which, when once determined, will always be available.

Supposing that the mill was running only 36 hours during the week and the actual payroll of the Carding Department amounted to $43.20.

Applying as the standard measure the full week of forty-eight hours the cost of manufacturing increased with the difference of 48–36 hours = 12 hours, which is thirty-three per cent of the total hours operated. But at the same time the payroll decreased. The standard wages are $48.00 and the actual card room wages for the week amounted to $43.20.

The reduction in working hours increased the cost of carding thirty-three per cent and, therefore, the cost was $1.33 per hour for the Carding Department. But payroll was reduced from $48.00 to $43.20, or ten per cent, which has decreased the cost of carding per hour $1.33 — 10% = $1.20.

Therefore—Cost increased for short week.....	+33%
Cost decreased for reduced payroll.....	—13%
Total cost of carding increased over standard...	20%

That the method of computation will not lose its simplicity no matter how complicated the conditions, is shown in the following illustration for roving operations. The efficiency of a department for the week is determined at the same time.

Standard Measures of Roving

Standard frame hours per week = 16 frames @ 48 hrs.
= 768 frame hours
Standard labor cost @ 48 hours = $130.56
Standard cost per frame hour = 17 cents

Production Standards

No. 3 Hank Roving = 31½ pounds per frame hour
No. 4 Hank Roving = 21 pounds per frame hour
No. 5 Hank Roving = 15 pounds per frame hour

Department reported the following conditions:

Short week of thirty-two hours, part of equipment idle, only three hundred frame hours used.

Payroll amounted to $67.50 for the following production:

No. 3 Hank Roving =	2815 pounds
No. 4 Hank Roving =	900 pounds
No. 5 Hank Roving =	1050 pounds
Total.....	2765 pounds

By dividing the above reported production by the standards per frame hour, the result will be the difference between the actual and standard frame hours.

2515 ÷ 31.5 =	80 frame hours
900 ÷ 21.0 =	43 frame hours
2050 ÷ 15.0 =	136 frame hours
Total.....	259 standard frame hours

Reported Frame Hours	300
Loss in Frame Hours	41
Efficiency of Roving	86.5%

What was the cost of roving labor for that week?

The short week increased the cost by:

Standard	48 hours
Less actual	32 hours
Difference	16 hours

which is 50% of actual frame hours

The department reported that some of the equipment was idle and only three hundred frame hours were used, which on a forty-eight hour basis would have been equal according to the standard formula:

$$\frac{\text{Standard Week Hours}}{\text{Actual Week Hours}} = \text{Actual Frame Hours} = 450 \text{ Frame Hrs.}$$

Standard Frame Hours	768
Actual Frame Hours on 48 Hour Basis	450
Idle Frame Hours on 48 Hour Basis	318

As shown above, the efficiency of the department was only 86.5% and during 32 hours this caused a loss of 41 frame hours which on a 48 hour standard basis, according to above described formula, will amount to 61 frame hours loss.

Loss due to idle frame hours	318
Loss due to inefficiency	61
Total frame hour loss	379

which increased the cost 97%

The payroll was, however, only $67.50 for the week instead of standard $130.56; therefore, the cost decreased:

130.56 — 67.50 = 63.06, which is 93.2% of actual payroll

Therefore, the actual manufacturing cost for the week was:

Short Week	50 %
Idle Equipment and Inefficiency	97 %
Reduction of Payroll	—93.2%
Total	53.8%

and the cost for each roving produced was, therefore, 53.8% greater than standard.

Method of Determining Changes of Burden

By referring to chart, Illustration 150, on standard burden costs it will be clear to everyone that the above described procedure of determining weekly costs is applicable to manufacturing burden also.

Burden is based on standard conditions, namely, the plant running at full capacity and full week. Its relation to productive labor cost is determined under the above described conditions. There is, therefore, a certain amount of burden that must be distributed over the manufactured product for a definite period and if, during such period, the production is less than normal the burden share of each product will be greater in proportion to the curtailment of production. For instance, if the standard burden for a week is $1,000.00, determined on full capacity operation, and the productive labor under full capacity operation is also $1,000.00, standard burden is 100% of the productive labor. If the plant operates only half capacity and the productive labor is only $500.00, the burden will remain $1,000.00 just the same and therefore the burden share of the productive labor is now 200%. Therefore, the productive hours of a plant, the machine hours occupied, and the efficiency of the plant will measure burden increases and decreases as much as it will measure the increases and decreases of productive and non-productive labor. This being the case, correction

tables will give the actual burden without the necessity of elaborate calculations.

In the development of such burden correction tables it should be remembered that when a plant is idle the burden is not as great as when a plant is in full operation. Power, light and heat, and a great portion of the supplies are not used when the plant is idle, and in the development of such correction tables due consideration should be given to this fact and such difference deducted from the burden totals. A reduction of burden due to idleness may vary from 20% to 50%, and it has been found that in the textile industry in general it averages approximately 30%. Therefore, if a mill is idle, during the period of idleness, the expenses of the burden item are only about 70% of the burden when the plant is in operation at full capacity.

There is still an uncertainty on what manufacturing divisions the distribution of burden should take place, and the safest method is to divide the manufacturing processes into departments in which the semi-finished product is completed. According to this a spinning and weaving plant should divide its manufacturing burden into two divisions such as spinning and weaving, and for the time and operation standards consider the standards of the spinning and weaving departments separately. Similarly, for the knitting industry, the knitting and finishing operations suggest such natural divisions. There is an important reason for such divisions. A mill may operate the spinning department on part time and the weaving department at full capacity, or vice versa, in which case the correct distribution of burden is impossible unless it is determined for each division separately.

Arrangement of Correction Tables

From the foregoing explanation it is evident that for each operation there must be a chart of standards and

the corresponding correction tables that will tell without further computations the percentage that should be added or deducted for each change in pay-roll, week hours, machine hours, and efficiency. The probable total changes

CONDITION	
I. Productive Labor Compensated by Day Work	A. Equipment working full capacity in full week but total productive labor of department above standard
	B. Equipment working full capacity in full week but total productive labor of department below standard
	C. Department runs full week but some equipment was idle with total productive labor of department below standard
	D. Mill running on short time with total productive labor of department below standard
	E. Mill running on short time with total productive labor of department below standard and equipment running part time
	F. Mill running overtime with total productive labor of department above standard and equipment running part time
II. Productive Labor Compensated by Piece Work.	A. Same as 1A, 1B, 1C, 1D or 1E
	B. Determining efficiency of piece worker
III. Departmental Non-Productive Labor.	A. Equipment working full capacity in full week but non-productive labor cost above standard. Productive efficiency below standard
	B. Equipment working full capacity in full week but non-productive labor cost below standard. Productive efficiency above standard
	C. Department runs full week but some equipment was idle with total non-productive labor of department below standard
	D. Mill running on short time with total non-productive labor of department below standard
	E. Productive efficiency
IV. General Departmental Non-Productive Wages and Labor (to be computed under last operation of department)	Same as III.
V. Burden (exclusive of non-productive labor) based upon productive labor	A. Burden rate standard but mill running on short time
	B. Burden rate standard but mill running on overtime
	C. Burden rate changes
	D. Burden rate standard but mill running full time on partial equipment

Form 153. Table of Changes of Conditions That Will Affect Unit Cost

of conditions that might occur in the mill are illustrated in Table 153. In order to enable the reader to construct such correction tables a number of illustrations are given showing in detail the method of construction, together with simple formulas which tell how the various proportions should be determined.

ILLUSTRATION 154

PRODUCTIVE LABOR

CORRECTION TABLE NO. 1-A

CARDING DEPARTMENT WAGE COST—FULL TIME OPERATION

If weekly wage cost is greater than standard add per cent. of difference to standard cost.

If weekly wage cost is less than standard deduct per cent. of difference from standard cost.

Illustration 154, Correction Table 1-A—For the determination of productive labor in the Carding Department when a plant is in full operation.

Difference	+ or — %	Difference	+ or — %	Difference	+ or — %	Difference	+ or — %
.50	.5	11.	10.	21.50	19.5	32.	29.1
1.00	.9	11.50	10.5	22.	20.	32.50	29.5
1.50	1.4	12.	10.9	22.50	20.5	33.	30.
2.	1.8	12.50	11.4	23.	20.9	33.50	30.5
2.50	2.3	13.	11.8	23.50	21.4	34.	30.9
3.	2.7	13.50	12.3	24.	21.8	34.50	31.4
3.50	3.2	14.	12.7	24.50	22.3	35.	31.8
4.	3.6	14.50	13.2	25.	22.7	35.50	32.3
4.50	4.1	15.	13.6	25.50	23.2	36.	32.7
5.	4.6	15.50	14.1	26.	23.6	36.50	33.2
5.50	5.	16.	14.6	26.50	24.1	37.	33.6
6.	5.5	16.50	15.	27.	24.5	37.50	34.1
6.50	5.9	17.	15.5	27.50	25.	38.	34.5
7.	6.4	17.50	15.9	28.	25.5	38.50	35.
7.50	6.8	18.	16.4	28.50	25.9	39.	35.5

Difference	+ or — %	Difference	+ or — %	Difference	+ or — %	Difference	+ or — %
8.	7.3	18.50	16.8	29.	26.4	39.50	35.9
8.50	7.7	19.	17.3	29.50	26.8	40.	36.4
9.	8.2	19.50	17.7	30.	27.3	40.50	36.8
9.50	8.6	20.	18.2	30.50	27.7	41.	37.3
10.	9.1	20.50	18.6	31.	28.2	41.50	37.7
10.50	9.6	21.	19.1	31.50	28.6	42.	38.2

Form 154

ILLUSTRATION 155

CORRECTION TABLE NO. 1-B

CARDING DEPARTMENT PRODUCTIVE LABOR WAGE COST

(Part time or overtime operation)

If weekly wage cost is less than standard deduct per cent. of difference from standard cost.

If weekly wage cost is more than standard add per cent. of difference to standard cost.

Illustration 155, Correction Table 1-B—Productive labor wage cost for Carding Department, the department operating on part-time or overtime operation.

Difference	— %	Difference	— %	Difference	— %	Difference	— %
.50	.5	27.50	33.3	55.	100	82.50	300
1.	1.	28.	34.1	55.50	102	83.	307
1.50	1.4	28.50	35.	56.	104	83.50	315
2.	2.	29.	35.8	56.50	106	84.	323
2.50	2.2	29.50	36.1	57.	108	84.50	332
3.	2.7	30.	37.5	57.50	110	85.	340
3.50	3.3	30.50	38.3	58.	112	85.50	349
4.	3.8	31.	39.2	58.50	114	86.	358
4.50	4.2	31.50	40.1	59.	116	86.50	368
5.	4.8	32.	41.	59.50	118	87.	378
5.50	5.2	32.50	41.9	60.	120	87.50	389
6.	5.7	33.	42.9	60.50	122	88.	400
6.50	6.2	33.50	43.7	61.	124	88.50	412
7.	6.7	34.	44.7	61.50	126	89.	424

Difference	— %	Difference	— %	Difference	— %	Difference	— %
7.50	7.3	34.50	45.6	62.	129	89.50	436
8.	7.8	35.	46.6	62.50	132	90.	450
8.50	8.3	35.50	47.6	63.	134	90.50	464
9.	8.9	36.	48.6	63.50	136	91.	479
9.50	9.4	36.50	49.6	64.	139	91.50	495
10.	10.	37.	50.6	64.50	142	92.	511
10.50	10.5	37.50	51.7	65.	144	92.50	529
11.	11.	38.	52.8	65.50	147	93.	547
11.50	11.6	38.50	53.9	66.	150	93.50	566
12.	12.2	39.	55.	66.50	153	94.	587
12.50	12.8	39.50	56.	67.	156	94.50	610
13.	13.4	40.	57.1	67.50	159	95.	633
13.50	14.	40.50	58.2	68.	162	95.50	658
14.	14.6	41.	59.3	68.50	165	96.	686
14.50	15.2	41.50	60.6	69.	168	96.50	715
15.	15.8	42.	61.8	69.50	172	97.	746
15.50	16.3	42.50	63.	70.	175	97.50	780
16.	17.	43.	64.2	70.50	178	98.	817
16.50	17.7	43.50	65.3	71.	182	98.50	857
17.	18.2	44.	66.7	71.50	186	99.	900
17.50	18.9	44.50	68.	72.	189	99.50	947
18.	19.6	45.	69.2	72.50	193	100.	1000
18.50	20.2	45.50	70.6	73.	198	100.50	1057
19.	20.9	46.	71.9	73.50	201	101.	1122
19.50	21.6	46.50	73.2	74.	206	101.50	1194
20.	22.2	47.	74.6	74.50	210	102.	1275
20.50	22.9	47.50	76.	75.	214	102.50	1366
21.	23.6	48.	77.4	75.50	219	103.	1470
21.50	24.2	48.50	78.8	76.	224	103.50	1592
22.	25.5	49.	80.3	76.50	228	104.	1733
22.50	25.7	49.50	81.8	77.	233	104.50	1900
23.	26.4	50.	83.3	77.50	238	105.	2100
23.50	27.2	50.50	84.9	78.	244	105.50	2340
24.	27.9	51.	86.5	78.50	249	106.	2650
24.50	28.7	51.50	88.	79.	255	106.50	3040
25.	29.4	52.	89.6	79.50	261	107.	3570
25.50	30.2	52.50	91.4	80.	267	107.50	4300
26.	31.	53.	93.	80.50	273	108.	5400
26.50	31.8	53.50	94.7	81.	279	108.50	7230
27.	32.6	54.	96.4	81.50	286	109.	10900
		54.50	98.2	82.	293	109.50	21900

ILLUSTRATION 156

CORRECTION TABLE NO. 2

PRODUCTIVE LABOR

(If card hours are more or less than standard)

If card hours are less than standard add difference to standard cost.

If card hours are more than standard deduct difference from standard cost.

Illustration 156, Correction Table 2—Productive labor showing what percentage should be added to the cost if the machine hours are less than standard, or, in other words, if part of the equipment was idle.

Card Hours Difference	+ %	Card Hours Difference	+ %	Card Hours Difference	+ %	Card Hours Difference	+ %
10	1.	350	34.2	690	101	1030	304
20	1.5	360	35.5	700	105	1040	317
30	2.	370	37.	710	108	1050	329
40	3.	380	38.5	720	111	1060	342
50	4.	390	40.	730	114	1070	356
60	5.	400	41.5	740	117	1080	372
70	5.5	410	42.5	750	121	1090	390
80	6.	420	44.5	760	124	1100	408
90	7.	430	45.5	770	129	1110	426
100	7.5	440	47.5	780	133	1120	447
110	8.5	450	49	790	137	1130	471
120	9.5	460	50.5	800	141	1140	496
130	10.5	470	52.	810	145	1150	523
140	11.5	480	54	820	149	1160	552
150	12.	490	55.5	830	154	1170	585
160	13.	500	57.5	840	159	1180	620
170	14.	510	59.5	850	163	1190	662
180	15.	520	61.5	860	169	1200	705
190	16.	530	63.	870	174	1210	755
200	17.	540	65.	880	180	1220	815
210	18.	550	67.	890	186	1230	880
220	19.	560	69.	900	192	1240	950
230	20.	570	71.	910	198	1250	1040
240	21.	580	73.5	920	205	1260	1145
250	22.	590	76.	930	212	1270	1270

Card Hours Difference	+ %	Card Hours Difference	+ %	Card Hours Difference	+ %	Card Hours Difference	+ %
260	23.	600	78.	940	219	1280	1415
270	25.	610	80.	950	226	1290	1610
280	26.	620	83.	960	234	1300	1850
290	27.	630	85.	970	244	1310	2180
300	28.	640	87.	980	252	1320	2640
310	29.	650	90.	990	261	1330	3315
320	30.	650	93.	1000	271	1340	4460
330	31.5	670	96.	1010	280	1350	6750
340	33.	680	98.5	1020	297	1360	

Form 156

ILLUSTRATION 157

CORRECTION TABLE NO. 3

CARDING DEPARTMENT NON-PRODUCTIVE LABOR

(If week hours are more or less than standard)

If week hours are less than standard add difference to standard cost.

If week hours are more than standard deduct difference from standard cost.

Illustration 157, Correction Table 3—Showing what percentage should be added or deducted from standard cost if the department worked overtime or less than the standard week hours.

Hours per Week	%	Equal Card Hours	Hours per Week	%	Equal Card Hours	Hours per Week	%	Equal Card Hours
60	—20.	1707	40	20.	1140	20	140.	570
59	—18.7	1678	39	23.	1111	19	150.	541
58	—17.3	1650	38	26.	1083	18	177.	513
57	—13.9	1621	37	30.	1054	17	182,	484
56	—14.3	1593	36	33.	1026	16	200.	456
55	—12.8	1564	35	37.	997	15	220.	427
54	—11.2	1536	34	41.	969	14	236.	399
53	—9.5	1507	33	45.5	940	13	269.	370
52	—7.7	1479	32	50.	912	12	300.	342
51	—6.	1450	31	55.	883	11	336.	313
50	—4.	1422	30	+60.	855	10	378.	285
49	—2.	1396	29	65.5	826	9	435.	256
48	0.	1368	28	71.5	798	8	502.	228

Hours per Week	%	Equal Card Hours	Hours per Week	%	Equal Card Hours	Hours per Week	%	Equal Card Hours
47	+2.	1339	27	78.	769	7	558.	199
46	4.	1311	26	85.5	741	6	706.	171
45	7.	1282	25	92.	712	5	870.	142
44	9.	1254	24	100.	684	4	1108.	114
43	12.	1225	23	109.	655	3	1510.	85
42	14.5	1197	22	118.	627	2	2280.	57
41	17.	1168	21	129.	598	1	3900.	28

Form 157

ILLUSTRATION 158

CORRECTION TABLE NO. 4-A

NON-PRODUCTIVE LABOR

ROVING DEPARTMENT WAGE COST

(Full machine hours and full time operation)

If weekly wage cost is greater than standard add per cent. of difference to standard.

If weekly wage cost is less than standard deduct per cent. of difference from standard cost.

Illustration 158, Correction Table 4-A—A roving department wage-cost table for non-productive labor, department working full time showing what percentage should be added or deducted from standard cost if the departmental pay-roll is above or below standard.

Difference — $	+ or — %	Difference — $	+ or — %	Difference — $	+ or — %	Difference — $	+ or — %
.50	.38	13.	9.96	25.50	19.53	38.	29.11
1.	.77	13.50	10.34	26.	19.91	38.50	29.49
1.50	1.15	14.	10.72	26.50	20.30	39.	29.87
2.	1.53	14.50	11.11	27.	20.68	39.50	30.25
2.50	1.91	15.	11.49	27.50	21.06	40.	30.64
3.	2.30	15.50	11.87	28.	21.45	40.50	31.02
3.50	2.68	16.	12.26	28.50	21.83	41.	31.40
4.	3.06	16.50	12.64	29.	22.21	41.50	31.79
4.50	3.45	17.	13.02	29.50	22.59	42.	32.17
5.	3.83	17.50	13.40	30.	22.98	42.50	32.55

Difference — $	+ or — %	Difference — $	+ or — %	Difference — $	+ or — %	Difference — $	+ or — %
5.50	4.21	18.	13.79	30.50	23.36	43.	32.94
6.	4.60	18.50	14.17	31.	23.74	43.50	33.32
6.50	4.98	19.	14.55	31.50	24.13	44.	33.70
7.	5.36	19.50	14.94	32.	24.51	44.50	34.08
7.50	5.74	20.	15.32	32.50	24.89	45.	34.47
8.	6.13	20.50	15.70	33.	25.28	45.50	34.85
8.50	6.51	21.	16.08	33.50	25.66	46.	35.23
9.	6.89	21.50	16.47	34.	26.04	46.50	35.62
9.50	7.28	22.	16.85	34.50	26.42	47.	36.
10.	7.66	22.50	17.23	35.	26.81	47.50	36.38
10.50	8.04	23.	17.62	35.50	27.19	48.	36.77
11.	8.43	23.50	18.	36.	27.57	48.50	37.15
11.50	8.81	24.	18.38	36.50	27.96	49.	37.53
12.	9.19	24.50	18.77	37.	28.34	49.50	37.91
12.50	9.57	25.	19.15	37.50	28.72	50.	38.30

Form 158

ILLUSTRATION 159

CORRECTION TABLE NO. 4-B

NON-PRODUCTIVE LABOR

ROVING DEPARTMENT WAGE COST

(If week or machine hours are more or less than standard.)

If wage cost is less than standard deduct per cent. of difference from standard cost.

If wage cost is more than standard add per cent. of difference to standard cost.

Illustration 159, Correction Table 4-B—For roving department wage cost showing what percentage should be added or deducted from pay-roll if the department is working more or less than standard hours.

Payroll Difference	—%	Payroll Difference	—%	Payroll Difference	—%	Payroll Difference	—%
.50	.3	16.50	14.5	32.50	33.2	49.	60.
1.	.7	17.	15.	33.	33.9	49.50	61.1
1.50	1.1	17.50	15.5	33.50	34.6	50.	62.1
2.	1.5	18.	16.	34.	35.2	50.50	63.

Payroll Difference	—%	Payroll Difference	—%	Payroll Difference	—%	Payroll Difference	—%
2.50	2.	18.50	16.5	34.50	36.	51.	64.2
3.	2.3	19.	17.	35.	36.7	51.50	65.2
3.50	2.7	19.50	17.5	35.50	37.3	52.	66.1
4.	3.	20	18.	36.	38.1	52.50	67.2
4.50	3.4	20.50	18.5	36.50	38.8	53.	68.2
5.	4.	21.	19.	37.	39.6	53.50	69.4
5.50	4.3	21.50	19.6	37.50	40.3	54.	70.6
6.	4.8	22.	20.2	38.	41.1	54.50	71.7
6.50	5.1	22.50	20.8	38.50	41.9	55.	72.8
7.	5.5	23.	21.4	39.	42.7	55.50	74.
7.50	6.	23.50	22.	39.50	43.4	56.	75.1
8.	6.5	24.	22.5	40.	44.2	56.50	76.3
8.50	7.	24.50	23.1	40.50	45.	57.	77.5
9.	7.3	25.	23.7	41.	45.8	57.50	78.7
9.50	7.8	25.50	24.2	41.50	46.6	58.	80.
10.	8.3	26.	25.	42.	47.5	58.50	81.2
10.50	8.7	26.50	25.5	42.50	48.2	59.	82.5
11.	9.1	27.	26.1	43.	49.1	59.50	83.8
11.50	9.6	27.50	26.7	43.50	50.	60.	85.
12.	10.1	28.	27.3	44.	50.9	60.50	86.4
12.50	10.6	28.50	28.	44.50	51.8	61.	87.7
13.	11.	29.	28.6	45.	52.7	61.50	89.
13.50	11.6	29.50	29.2	45.50	53.6	62.	90.5
14.	12.	30.	29.9	46.	54.4	62.50	91.9
14.50	12.5	30.50	30.6	46.50	55.3	63.	93.2
15.	13.	31.	31.1	47.	56.2	63.50	94.8
15.50	13.5	31.50	31.9	47.50	57.2	64.	96.2
16.	14.	32.	32.4	48.	58.1	64.50	97.7
				48.50	59.2	65.	99.2

Overtime

Difference Payroll	+%	Difference Payroll	+%	Difference Payroll	+%	Difference Payroll	+%
.50	.4	8.	7.2	15.50	14.0	23.	21.
1.	1.	8.50	7.6	16.	14.5	23.50	21.4
1.50	1.3	9.	8.1	16.50	15.	24.	21.9
2.	1.8	9.50	8.6	17.	15.5	24.50	22.3
2.50	2.2	10.	9.1	17.50	16.	25.	22.8
3.	2.7	10.50	9.5	18.	16.4	25.50	23.2
3.50	3.1	11.	10.	18.50	16.9	26.	23.7
4.	3.6	11.50	10.4	19.	17.3	26.50	24.1
4.50	4.	12.	10.9	19.50	17.9	27.	24.6
5.	4.5	12.50	11.4	20.	18.2	27.50	25.1

Difference Payroll	+%	Difference Payroll	+%	Difference Payroll	+%	Difference Payroll	+%
5.50	5.	13.	11.8	20.50	18.7	28.	25.5
6.	5.4	13.50	12.2	21.	19.1	28.50	26.
6.50	5.9	14.	12.8	21.50	19.5	29.	26.5
7.	6.4	14.50	13.2	22.	20.	29.50	27.
7.50	6.9	15.	13.6	22.50	20.5	30.	27.4

Form 159

ILLUSTRATION 160

CORRECTION TABLE NO. 5

NON-PRODUCTIVE LABOR—ROVING DEPARTMENT

If frame hours are less than standard add per cent. of difference to standard cost.

If frame hours are more than standard deduct per cent. of difference from standard cost.

Illustration 160, Correction Table 5—Showing what percentage should be added to standard cost if only partial equipment is in operation.

Hours Difference	%	Hours Difference	%	Hours Difference	%	Hours Difference	%
10	1.	200	35.	390	102.	580	306.
20	2.5	210	37.5	400	108.	590	328.
30	4.	220	40.	410	114.	600	353.
40	5.5	230	42.5	420	120.	610	380.
50	7.	240	45.	430	126.	620	415.
60	8.	250	48.	440	133.	630	450.
70	10.	260	51.	450	140.	640	495.
80	11.5	270	54.	460	148.	650	540.
90	13.	280	57.5	470	156.	660	600.
100	15.	290	60.	480	165.	670	670.
110	16.5	300	64.	490	175.	680	755.
120	18.	310	67.5	500	185.	690	855.
130	20.	320	71.	510	196.	700	1000.
140	22.	330	75.	520	208.	710	1185.
150	24.	340	79.	530	221.	720	1440.
160	26.	350	83.	540	235.	730	1825.
170	28.5	360	87.5	550	250.	740	2460.
180	30.5	370	92.5	560	267.	750	3750.
190	32.5	380	97.	570	285.	760	7700.

Form 160

ILLUSTRATION 161

CORRECTION TABLE NO. 6

MANUFACTURING BURDEN

If hours worked are less than standard add corresponding per cent. to standard burden.

If plant worked more than standard deduct corresponding per cent. from standard burden.

Burden is based on spinning frame hours.

Illustration 161, Correction Table 6—Showing what percentage should be added or deducted from standard burden if a mill is operating less than full week or on overtime.

Hours Worked During Week	Corresponding Frame Hours	Corrections in Percents	Hours Worked During Week	Corresponding Frame Hours	Corrections in Percents	Hours Worked During Week	Corresponding Frame Hours	Corrections in Percents
1	72	3290.	21	1512	90.	41	2892	11.9
2	144	1610.	22	1584	82.6	42	3024	10.
3	216	1050.	23	1656	76.	43	3096	8.1
4	288	770.	24	1728	70.	44	3168	6.3
5	360	602.	25	1800	64.5	45	3240	4.7
6	432	490.	26	1872	59.2	46	3312	3.
7	504	410.	27	1944	54.5	47	3384	1.4
8	576	350.	28	2016	50.	48	3456	0.
9	648	303.5	29	2088	45.1	49	3528	—1.
10	720	266.	30	2160	42.	50	3600	—2.
11	792	235.5	31	2232	38.4	51	3672	—3.
12	864	210.	32	2304	35.	52	3744	—4.
13	936	188.4	33	2376	31.8	53	3816	—5.
14	1008	170.1	34	2448	28.8	54	3888	—6.
15	1080	154.	35	2520	26.	55	3980	—7.
16	1152	140.	36	2592	23.3	36	4032	—8.
17	1224	127.5	37	2664	20.8	57	4104	—9.
18	1296	116.7	38	2736	18.4	58	4176	—10.
19	1368	106.9	39	2808	16.1	59	4248	—11.
20	1440	98.	40	2880	14.	60	4320	—12.

Form 161

ILLUSTRATION 162

CORRECTION TABLE NO. 7

BURDEN RATE CHANGE

If Burden is more than standard add per cent. of difference to standard burden.

If Burden is less than standard deduct per cent. of difference from standard burden.

Illustration 162, Correction Table 7—Burden rate change showing what percentage should be added or deducted from standard burden if the burden rate of the mill changes.

Difference $	+ or — %	Difference $	+ or — %
50	1.16	550	12.76
100	2.32	600	13.92
150	3.48	650	15.08
200	4.64	700	16.24
250	5.8	750	17.40
300	6.96	800	18.56
350	8.12	850	19.72
400	9.28	900	20.88
450	10.44	950	22.04
500	11.60	1000	23.20

Form 162

How to Use the Above Tables and Charts

It is not expected that without a careful study of the construction and the development of the charts and correction tables a reader will be able to develop such instruments of control. For this reason an instruction chart, Illustration 163, has been designed showing from step to step the proper procedure together with an illustration of the procedure. By carefully following the instructions and the procedure given in the illustrations the reader will have no difficulty in acquiring this method of cost determination.

The handling of the records is so simple that a clerk with average intelligence can take care of all the work connected with cost determination for an average size mill. The information obtained by the management is comprehensive and full of meaning. A report telling that the cost of manufacturing in a department during the week was 15% above or 7% below standard will mean considerably more to the practical mill man than a multitude of figures showing variations of costs but not giving a direct comparison.

Similarly a quotation for a new article may be made in a few minutes by determining the standard costs from the charts and adding to this standard the current percentage that production is above or below the standard cost.

The above-described standardized cost control eliminates not only the possibility of hasty and incorrect quotations, but with the assistance of the standard tables the cost is obtainable in a few minutes and the correct and dependable quotation may be made promptly to assure the possibilities of obtaining the order.

This about completes the discussion of the standardized cost methods as applied to the textile industry and it is sincerely hoped that the time is not far away when there will be no textile plant in the United States where a scientific system is not used for the control of costs. Such a step together with the development of uniform cost-control systems for the various branches of the industry will assure a freedom from unfair competition which, in most instances, is caused today through the inaccurate knowledge of manufacturing cost.

CHAPTER XIX

ILLUSTRATIONS OF PROCEEDURE OF COST DETERMINATION, FOR GRAPHIC COST CONTROL METHOD

ILLUSTRATION 164

DAY WORK, PRODUCTIVE LABOR

Equipment working full capacity and full week, but the Productive Labor Cost is greater than standard.

CARD ROOM

Standard Card Hours	1,368
Standard Productive Labor	$109.44

CONDITIONS PRESUMED

The cards have no hank counters.

Some of the stock is too poor to be run at normal speed.

At the end of the week the following report is made by the Card Room:

Stock	Hank	Grains	Doffer Speed	Card Hours
A	12	65K	15	480
B	16	55C	14	192
C	18	60K	15	284
D	18	50C	14	96
E	26	50K	15	316

According to pay-roll of the week the Card Room Productive Labor amounted to $116.34.

What was the production of the Card Room? From Cost and Production Chart for Carding Operation, the following information is obtained directly:

65K	grains	20.2	pounds	per	card	hour
55C	"	15.9	"	"	"	"
60K	"	18.6	"	"	"	"
50C	"	14.5	"	"	"	"
50K	"	15.5	"	"	"	"

By multiplying the above unit factors by the reported card hours the production of the Card Room is obtained as follows:

65K (480 x 20.2)=	9,696	pounds
55C (192 x 15.9)=	3,053	"
60K (284 x 18.6)=	5,282	"
50C (96 x 14.5)=	1,392	"
50K (316 x 15.5)=	4,898	"
Total production....	24,321	"

What was the cost of carding of each?

Actual payroll cost.....	$126.34
Standard cost	109.44
Cost above standard.....	$16.90

From Correction Table 1 it is obtained directly that the actual cost is 15.4% higher than the standard cost. The Standard Cost is obtained directly from the Cost and Production Chart of carding operation as follows:

Grains	Standard Cost per Pound
65K	.396 cents
55C	.503 "
60K	.432 "
50C	.553 "
50K	.518 "

Multiplying each by 15.4% and adding to standard cost the actual carding cost per pound for each kind and grain of silver is obtained as follows:

Grains	Actual Productive Labor Cost per Pound
65K	.457 cents
55C	.578 "
60K	.499 "
50C	.638 "
50K	.598 "

Form 164

ILLUSTRATION 165

DAY WORK, PRODUCTIVE LABOR

Equipment working full capacity and full week, but Productive Labor Cost is less than standard.

According to payroll of the week the Card Room Productive Labor amounted to $98.25, or $11.19 less than standard.

The general procedure will be the same as described for Illustration 1. From Correction Table 1 it is obtained that the actual cost is 10.2% less than standard, and accordingly it will be:

Grains	Actual Cost per Pound
65K	.356 cents
55C	.452 "
60K	.338 "
50C	.497 "
50K	.465 "

Form 165

ILLUSTRATION 166

DAY WORK, PRODUCTIVE LABOR

Department working full week, but some of the equipment was idle.

At the end of the week the Card Room makes the following report:

Stock	Hank	Grains	Doffer Speed	Card Hours
A	12	65K	15	236
B	16	66C	14	144
C	18	60K	15	260
D	18	50C	14	96
E	26	50K	15	220

Total card hours..... 956
Standard card hours..... 1,368
Card hours idle..... 412

According to payroll of the week the Card Room Productive Labor for the week amounted to $87.29.

What was the production of the Card Room?

From Cost and Production Chart for Carding operation the following information is obtained directly:

Grains				
65K	grains	20.2	pounds per	hour
55C	"	15.9	" "	"
60K	"	18.6	" "	"
50C	"	14.5	" "	"
50K	"	15.5	" "	"

By multiplying the above unit factors by the reported card hours the production of the Card Room is obtained as follows:

65K (236 x 20.2) = 4,767 pounds
55C (144 x 15.9) = 2,290 "
60K (260 x 18.6) = 4,836 "
50C (96 x 14.5) = 1,392 "
50K (220 x 15.5) = 3,410 "

Total Production 16,695 "

What was the cost of carding of each?

The payroll of Productive Labor of the Carding Department for this week was $22.15 **less** than standard. From Correction Table 1-B it is obtained directly that the actual cost is 25.5% **lower** than standard.

But only part of the equipment was in operation, and the card hours were 412 hours less than standard. From Correction Table 2 it is obtained directly that on account of idle machinery the cost was 42.5% **higher** than standard. By adding these two percentages:

$$\begin{array}{r} -25.5 \\ +42.5 \\ \hline \end{array}$$

+17. % it is obtained that while the cost of productive labor was reduced, nevertheless the partial operation of the equipment caused the cost to be 17% above standard.

The Standard Cost being obtained from the Cost and Production Chart of carding operation directly as follows:

Grains	Standard Cost per Pound
65K	.396 cents
55C	.503 "
60K	.432 "
50C	.553 "
50K	.518 "

Multiplying each by 17% and adding to Standard Cost of each kind and grain of silver the actual cost per pound is obtained as follows:

Grains	Actual Cost
65K	.465 cents
55C	.588 "
60K	.505 "
50C	.646 "
50K	.606 "

Form 166

ILLUSTRATION 167

DAY WORK, PRODUCTIVE LABOR

Department running on short time but with full equipment, Productive Labor payroll below standard.

Stock	Hank	Grains	Doffer Speed	Card Hours
A	12	65K	15	216
B	16	55C	14	144
C	18	60K	15	250
D	18	50C	14	96
E	26	50K	15	206
Total Card Hours.....				912
Working Hours During Week.....				32
All Equipment in Operation.				

According to payroll of the week the Card Room payroll of the week amounted to $87.29.

What was the production of the Card Room?

From the Cost and Production Chart for Carding operation the following information is obtained directly:

65K	20.2	pounds	per	hour
55C	15.9	"	"	"
60K	18.6	"	"	"
50C	14.5	"	"	"
50K	15.5	"	"	"

By multiplying the above unit factors by the card hours the production of the Card Room is obtained as follows:

65K	(216 x 20.2) = 4,363	pounds
55C	(144 x 15.9) = 2,290	"
60K	(250 x 18.6) = 4,650	"
50C	(96 x 14.5) = 1,392	"
50K	(206 x 15.5) = 3,193	"
Total Production	15,888	"

What was the cost of carding of each?

The payroll of Productive Labor of the Carding Department for this week was $22.15 less than standard. From Correction Table 1-B it is obtained directly that the actual cost is 25.5% lower than standard. But the equipment did not work a full week but only 32 working hours.

From Correction Table 3 it is obtained directly that on account of the short week 50% must be added to standard cost to obtain the actual carding cost for the week.

Adding the two per cents:

$$\begin{array}{r} -25.5 \\ +50. \\ \hline +24.5\% \end{array}$$

it is obtained that while the cost of productive labor was reduced but nevertheless the short-time operation of the equipment caused the cost to be 24.5% higher than standard.

The standard cost being obtained from the Cost and Production Chart of carding operations directly as follows:

Grains	Standard Cost per Pound
65K	.396 cents
55C	.503 "
60K	.432 "
50C	.553 "
50K	.518 "

Multiplying each by 24.5% and adding to standard cost for each kind and grain of silver the actual cost per pound is obtained as follows:

Grains	Actual Cost
65K	.490 cents
55C	.626 "
60K	.538 "
50C	.688 "
50K	.645 "

Form 167

ILLUSTRATION 168

DAY WORK, PRODUCTIVE LABOR

Department running on short time and on partial equipment only.

Productive labor payroll below standard.

At the end of the week the Carder makes the following report:

Stock	Hank	Grains	Doffer Speed	Card Hours
A	12	65K	15	182
B	16	55C	14	144
C	18	60K	15	204
D	18	50C	14	48
E	28	50K	15	206
Total Card Hours				784
Working Hours During Week				32

According to Table 3 the Standard Card Hours for 32 working hours are equal to 912, while according to report the actual machine hours worked are 128 card hours less, which difference must be charged to cost.

What was the production of the Card Room?

From the Cost and Production Chart for the Carding operation the following information is obtained directly:

65K	20.2 pounds
55C	15.9 "
60K	18.6 "
50C	14.5 "
50K	15.6 "

By multiplying the above unit factors by the card hours the production of the Card Room is obtained as follows:

65K	(182 x 20.2) = 3,676	pounds
55C	(144 x 15.9) = 2,290	"
60K	(204 x 18.6) = 3,794	"
50C	(48 x 14.5) = 696	"
50K	(206 x 15.5) = 3,193	"
Total Production	13,649	"

What was the cost of carding for each?

The payroll for the week was $74.33, or $35.11 less than standard. From Correction Table B-1 it is obtained directly that the actual cost is 46.6% lower than standard, but the equipment worked during the week only 32 hours and some of the equipment was idle during the working

time because, according to Correction Table 3, if the plant had run full time during the 32 hours the card hours would have been equal to 912, while, according to the report of the department, they actually ran only 784 card hours. Therefore, the difference of card hours is equal to 128 for 32 hours, but this is equal to 192 hours on a 48 machine hour basis, and according to Table 2 the cost of production increased for the less hours worked 16%, and according to Table 3 on account of a short week 50%.

Adding the above per cents:

—46.6% for reduction in payroll
+16.0% for reduction in card hours
+50.0% for short week

+19.4%

proving that in spite of the decrease of payroll for productive labor the unit productive cost of carding increased 19.4% above standard. The standard cost is obtained from the Cost and Production Chart of carding operations directly as follows:

Grains	Standard Cost per Pound
65K	.396 cents
55C	.303 "
60K	.432 "
50C	.553 "
50K	.518 "

Multiplying each by 19.4% and adding to standard cost for each kind and grain of silver the actual cost per pound is obtained as follows:

Grains	Actual Cost
65K	.471 cents
55C	.601 "
60K	.516 "
50C	.661 "
50K	.619 "

ILLUSTRATION 169

DAY WORK, NON-PRODUCTIVE LABOR

Equipment working full capacity and full week, but non-productive labor cost is greater than standard. Productive efficiency below standard.

ROVING OPERATIONS

Standard Frame Hours of Roving..... 768
Standard Non-Productive Labor Cost.....$130.56

CONDITIONS PRESUMED

All frames have hank clocks. The roving consists of three operations — slubbing, intermediate and roving. The non-productive labor includes all day wages incidental to roving operation, such as carriers, oilers, banders, etc. The cost distributed on the production of the last roving operation.

At the end of the week the following report is made by the Roving Department:

Stock	Hank	Roving Hank	Frame Hours	Pounds Produced
A	12K	2.6	216	7,296
B	16C	2.8	48	1,595
C	18K	3.	168	5,135
D	18C	3.2	48	950
E	26K	3.7	144	3,360
F	30C	4.5	144	2,375

According to payroll of the week the Roving Non-Productive wages amounted to $157.95.

What was the efficiency of the Roving Department?

From Cost and Production Chart for Roving operation the following information is obtained directly:

2.6	37.5	pounds	per	frame	hours	
2.8	34.5	"	"	"	"	
3.	31.5	"	"	"	"	
3.2	29.	"	"	"	"	
3.7	24.	"	"	"	"	
4.5	18.	"	"	"	"	

By dividing the reported production for each roving hank by the above standards the standard frame-hour requirement for each hank roving is obtained as follows:

2.6	7,296 ÷ 37.5 = 194.5	frame	hours
2.8	1,595 ÷ 34.5 = 46.5	"	"
3.	5,135 ÷ 31.5 = 163.	"	"
3.2	950 ÷ 29. = 33.	"	"
3.7	3,360 ÷ 24. = 140.	"	"
4.5	2,375 ÷ 18. = 132.	"	"

Total Standard Frame Hours 709.

The efficiency of the Roving operation is, therefore, obtained by dividing the standard frame hours by the actual frame hours as follows:

2.6	194.5 ÷ 216 = 90%
2.8	46.5 ÷ 48 = 97%
3.	163. ÷ 168 = 97%
3.2	33. ÷ 48 = 69%
3.7	140. ÷ 144 = 97%
4.5	132. ÷ 144 = 92%
Total	709. ÷ 768 = 92½%

What was the cost of roving non-productive labor for each hank?

Actual Payroll Cost	$157.95
Standard Cost	130.56
Cost Above Standard	$27.39

From Correction Table 4-B it is obtained directly that the actual cost is 26% greater than the standard cost. Also as shown above, the efficiency of the roving operation was 59 frame hours below standard, and according to Correction 5 this fact increased the cost per pound 7.9%. Therefore, the actual cost for each hank size of roving is above the standard cost, with

Non-Productive Labor Cost Above Standard..	26%
Efficiency Below Standard.....	7.9%
Total.....	33.9%

The standard cost for each hank is obtained directly from the Cost and Production Chart of roving operations as follows:

Hank Roving	Standard Cost per Pound
2.6	.455 cents
2.8	.493 "
3.	.54 "
3.2	.59 "
3.7	.71 "
4.5	.945 "

Multiplying each by 33.9% and adding to standard the actual cost of roving non-productive wages per pound is obtained for each hank of roving as follows:

Hank	Actual Cost per Pound
2.6	.609 cents
2.8	.660 "
3.	.723 "
3.2	.790 "
3.7	.950 "
4.5	1.265 "

THE PROOF

Roving Hank	Pounds	Cost of Day Wages Roving per Pound	Total Cost of Day Wages
2.6	7,296	.609 cents	$44.45
2.8	1,595	.660 "	10.52
3.	5,135	.723 "	37.10
3.2	950	.790 "	7.50
3.7	3,360	.950 "	31.90
4.5	2,375	1,265 "	30.10
		Total	$161.57
		Actual Payroll	157.95
			$3.62

Difference between Payroll Cost and Distributed Cost — 2%, or .0002c per pound.

Since non-productive labor and burden is approximately one-third of total cost, the factor of error for the total cost of the product will be about one-half of one per cent.

Form 169

ILLUSTRATION 170

Equipment working full capacity in full week, but non-productive labor cost below standard.

ROVING OPERATION

Standard Frame Hours of Roving.....	768
Standard Non-Productive Labor Cost....	$130.56

CONDITIONS PRESUMED

Same as Illustration 169.

At the end of the week the following report is made by the Roving Department:

Stock	Hank	Roving Hank	Frame Hours	Pounds Produced
A	12K	2.6	216	7,296
B	16C	2.8	48	1,595
C	18K	3.	168	5,135
D	18C	3.2	48	950
E	26K	3.7	144	3,360
F	30C	4.5	144	2,375

According to payroll of the week the roving non-productive wages amounted to $103.17.

What was the efficiency of the Roving Department?

From Cost and Production Chart for Roving operation the following information is obtained directly:

Hank Roving						
2.6	37.5	pounds	per	frame	hour	
2.8	34.5	"	"	"	"	
3.	31.5	"	"	"	"	
3.2	29.	"	"	"	"	
3.7	24.	"	"	"	"	
4.5	18.	"	"	"	"	

By dividing the reported production for each roving hank by the above standards the standard frame-hour requirement for each hank roving is obtained as follows:

Hank			
2.6	194.5	frame	hours
2.8	46.5	"	"
3.	163.	"	"
3.2	33.	"	"
3.7	140.	"	"
4.5	132.	"	"
Total	709.	standard frame hours	

The efficiency of the roving operation is, therefore, obtained by dividing the standard frame hours by the actual frame hours, 709 divided by 768 = 92½%.

What was the cost of roving non-productive labor for each hank?

Standard payroll cost	$130.56
Actual payroll cost	103.17
Cost Below Standard	$27.59

From Correction-Table 4-B it is obtained directly that the actual cost is 26.3% less than the standard cost. Also, as shown above, the efficiency of the roving operation was 59 frame hours below standard, and according to Correction Table 5 this increased the cost per pound with 7.9%. Therefore, the actual cost for each hank size of roving will be:

For cost below standard	—26%
For efficiency below standard	+ 7.9%
Total	—18.1%

The standard cost for each hank is obtained directly from the Cost and Production Chart of roving operations as follows:

Hank Roving	Standard Cost per Pound
2.6	.455 cents
2.8	.493 "
3.	.54 "
3.2	.59 "
3.7	.725 "
4.5	.945 "

Multiplying each by 18.1% and deducting from standard the actual cost of roving non-productive wages per pound is obtained, for each hank of roving, as follows:

Hank	Actual Cost per Pound
2.6	.372 cents
2.8	.404 "
3.	.442 "
3.2	.483 "
3.7	.593 "
4.5	.774 "

Form 170

ILLUSTRATION 171

DAY WORK, NON-PRODUCTIVE LABOR

Department operates full week, but some equipment was idle. Total non-productive labor of department below standard.

ROVING OPERATION

Standard Frame Hours of Roving..... 768
Standard Non-Productive Labor Cost..... $130.56

CONDITIONS PRESUMED

Same as Illustration 169.

At the end of the week the following report is made by the Roving Department:

Stock	Hank	Roving Hank	Frame Hours	Pounds Produced
A	12K	2.6	192	6.495
B	16C	2.8	48	1,595
C	18K	3.	120	3,715
D	18C	3.2	24	475
E	26K	3.7	72	1,680
F	30C	4.5	144	2,375
			Total Frame Hours	600

According to payroll for the week the roving non-productive wages amounted to $95.37.

What was the efficiency of the Roving Department?

From the Cost and Production Chart for roving operation the following information is obtained directly:

Hank Roving					
2.6	37.5	pounds	per	frame	hour
2.8	34.5	"	"	"	"
3.	31.5	"	"	"	"
3.2	29.2	"	"	"	"
3.7	24.	"	"	"	"
4.5	18.	"	"	"	"

By dividing the reported production for each roving hank by the above standards the standard frame requirement for each roving is obtained as follows:

Hank Roving				
2.6	173.2	standard	frame	hours
2.8	46.5	"	"	"
3.	118.	"	"	"
3.2	16.5	"	"	"
3.7	70.	"	"	"
4.5	132.	"	"	"
Total	556.	"	"	"

The efficiency of the roving operation is, therefore, obtained by dividing the standard frame hours by the actual frame hours $= \frac{556}{600} = 92.6\%$.

What was the cost of roving non-productive labor for each hank?

Standard payroll cost	$130.56
Actual payroll cost	95.37
Cost below standard	$35.19

From Correction Table 4-B it is obtained directly that the actual cost is 37% less than standard cost. Also as shown above the difference between actual frame hours and standard frame hours was 44 frame hours, and according to the report of the department during the week they have run 168 frame hours less than standard capacity. Therefore, the cost of operation has been increased by the loss of 208 frame hours which is, according to Correction Table 5, equal to 37% (the equivalent of 208 frame hours).

Therefore, the actual cost for each hank size roving will be:

For costs below standard	—37.0%
For frame hour losses below standard	+37.0%
Total	0.0%

Accordingly, the decrease in non-productive labor exactly offsets the loss of production and, therefore, the actual cost was equal to the standard as follows:

Hank Roving	Standard Cost per Pound
2.6	.455 cents
2.8	.493 "
3.	.540 "
3.2	.590 "
3.7	.710 "
4.5	.945 "

Form 171

ILLUSTRATION 172

DAY WORK, NON-PRODUCTIVE LABOR

Department running on short time and non-productive labor payroll below standard.

ROVING OPERATION

Standard Frame Hours of Roving..... 768
Standard Non-Productive Labor Cost..... $130.56

CONDITIONS PRESUMED

Same as Illustration 169.

At the end of the week the following report is made by the Roving Department:

Stock	Hank	Roving Hank	Frame Hours	Pounds Produced
A	12K	2.6	168	5,450
B	16C	2.8	48	1,495
C	18K	3.	96	2,785
D	18C	3.2	24	475
E	26K	3.7	72	1,615
F	30C	4.5	104	1,725
			Total Frame Hours 512	

ment running. According to payroll for the week the roving non-productive wages amounted to $89.50.
productive wages amounted to $89.50.

What was the efficiency of the Roving Department?

From the Cost and Production Chart for roving operation the following information is obtained directly:

Hank Roving						
2.6	37.5	pounds	per	frame	hour	
2.8	34.5	"	"	"	"	
3.	31.5	"	"	"	"	
3.2	29.	"	"	"	"	
3.7	24.	"	"	"	"	
4.5	18.	"	"	"	"	

By dividing the reported production for each roving hank by the above standards, the standard frame requirement for each roving is obtained as follows:

Hank Roving				
2.6	145.6	standard	frame	hours
2.8	43.3	"	"	"
3.	88.4	"	"	"
3.2	16.3	"	"	"
3.7	67.6	"	"	"
4.5	95.8	"	"	"
Total	457.0	"	"	"

The efficiency of the roving operation is, therefore, obtained by dividing the standard frame hours by the actual frame hours: 457 divided by 512 = 89.3%.

What was the cost of roving non-productive labor for each hank?

Standard Payroll Cost	$130.56
Actual Payroll Cost	89.50
Cost Below Standard	$41.06

From Correction Table 4-B it is obtained directly that the actual cost is 45.8% less than standard cost. Also, as shown above, the difference between actual frame hours and standard frame hours was 55 frame hours, which corresponds to 82 frame hours on a 48-hour basis. From Table 5, increase above standard cost equals 11.8%. The department operated only 32 hours during the week which, according to Correction Table 3 will increase the cost 50%.

—45.8%	for decrease of payroll
+11.8%	for reduction of frame hours
+50.0%	for reduction of week hours
+16.0%	increase over standard cost

From the Cost and Production Chart for Roving Operation the standard cost for each hank roving is obtained as follows:

Hank Roving	Standard Cost per Pound
2.6	.455 cents
2.8	.493 "
3.	.540 "
3.2	.590 "
3.7	.710 "
4.5	.945 "

The actual cost is obtained, therefore, by multiplying each cost factor by 16% and adding this to the standard cost as follows:

Hank Roving	Actual Cost
2.6	.528 cents
2.8	.572 "
3.	.626 "
3.2	.685 "
3.7	.824 "
4.5	1.095 "

Form 172

ILLUSTRATION 173

GENERAL DEPARTMENTAL NON-PRODUCTIVE LABOR

(Computed under the last operation of the Department)

DAY WORK, NON-PRODUCTIVE LABOR

CARDING DEPARTMENT

Frame hours upon which Carding Department General Burden is to be computed equals 768 (the Roving Frame Hours).

Standard Carding General Burden for 48 hours equals $153.60.

According to the payroll the carding general burden for that week amounted to $167.35.

Conditions Presumed

The department was running full capacity.

According to reports submitted the Roving Division of the department made the following production:

Stock	Hank	Roving Hank	Frame Hours	Pounds Produced
A	12K	2.6	216	7,296
B	16C	2.8	48	1,895
C	18K	3.	168	5,135
D	18C	3.2	48	950
E	26K	3.7	144	3,360
F	30C	4.5	144	2,375

From the roving report for the week is found that the efficiency of the department during the week was only 92.5%, equal to 709 frame hours as shown in Illustration 169.

What was the cost of carding general non-productive labor for each hank?

Actual Payroll Cost	$167.35
Standard Payroll Cost	153.60
Cost Above Standard	$13.75

From Correction Table 6 it is obtained directly that the actual cost is 9.8% greater than the standard cost.

But the efficiency of roving operations as shown above was 59 frame hours less than standard, and according to Correction Table 5 this fact increased the cost per pound 7.9%. Therefore, the actual cost of each hank size roving is above standard cost with

Carding General Burden Above Standard	9.8%
Efficiency Below Standard	7.9%
Total	17.7%

The Standard cost of each hank roving is obtained directly from the Cost and Production Chart of Roving Operations, as follows:

Hank Roving	Standard Carding General Burden per Pound
2.6	.532 cents
2.8	.58 "
3.	.635 "
3.2	.69 "
3.7	.835 "
4.5	1.11 "

Multiplying each 17.7% and adding to standard, the actual cost per pound of Carding General Non-Productive Labor is obtained for each hank roving as follows:

Hank Roving	Actual Carding General Burden per Pound
2.6	.6463 cents
2.8	.685 "
3.	.747 "
3.2	.812 "
3.7	.9825 "
4.5	1.3062 "

Form 173

ILLUSTRATION 174

BURDEN DISTRIBUTION

The burden includes all expenses exclusive of such non-productive labor that is charged directly to manufacturing cost.

The burden distribution is based upon the production of the last manufacturing department which is in this case the Spinning Department.

Conditions Presumed

Burden rate standard, but mill running on short time. According to the reports for the week the mill oper-

ated 36 hours and produced the following hanks of filling yarns:

Nos. 12, 15, 16, 22, 26, 32.

From the report of the Spinning Department it is obtained that the department was only 85% efficient and, therefore, the difference between the actual and standard frame hours was equal to 232 frame hours which is equal to, on 48-hour basis, 309 frame hours, which is equal to, according to Table 7, approximately four week hours, which means that the plant actually produced only during 32 hours which, according to Table 7, has increased the cost of burden 35%. According to standard Table of Burden Cost the standard burden on the yarns as reported above was as follows:

Yarn Number	Standard Burden Cost
12	3.3c per pound
15	4.1c " "
16	4.4c " "
22	5.4c " "
26	5.95c " "
32	6.4c " "

By adding 35% increase of cost of burden to the above standards the actual burden costs for the above yarns for the week is obtained as follows:

Yarn Number	Manufacturing Burden Cost for the Week
12	4.455c per pound
15	5.535c " "
16	5.94c " "
22	7.29c " "
26	8.033c " "
32	8.64c " "

Form 174

ILLUSTRATION 175

BURDEN DISTRIBUTION

Conditions Presumed

Burden rate standard, but mill running on overtime.

According to the report for the week the mill operated 52 hours and produced the following hanks of filling yarns:

Nos. 12, 15, 16, 22, 26, 32.

From the reports of the Spinning Department it is obtained that the department was only 85% efficient, which, based upon a 48-hour week is equal to a loss of 309 frame hours, which is equal on a 52-hour basis to a loss of 280 frame hours.

According to Table 7, 280 frame hours are equal to four working hours, which is equal to the difference between the standard and overtime hours per week.

The above conditions state the fact that while the mill worked overtime, the efficiency of the equipment not being up to standard, it wiped out the advantage of reduced burden by overtime. Therefore, the burden did not decrease but remained the same as the standard burden at 48-work-hour basis which is, according to the Table of Standard Burden Cost, equal for filling yarns as follows:

Yarn Number	Manufacturing Burden Cost for the Week
12	3.3c per pound
15	4.1c " "
16	4.4c " "
22	5.4c " "
26	5.95c " "
32	6.4c " "

Form 175

ILLUSTRATION 176

BURDEN RATE CHANGES

CONDITIONS PRESUMED

The expenses of the mill have increased or decreased to such an extent that it is necessary to change the burden rate of the mill monthly by $380.

Let it be presumed that the burden rate has to be increased and, according to Table 8, this fact increased the cost of the product of the mill by 12.76%. Applying the above increase to the yarn numbers as shown in Illustration 12 the increased cost of burden for each yarn will be as follows:

Yarn Number	Increased Burden Cost
12	3.72c per pound
15	4.725c " "
16	5.06c " "
22	6.09c " "
26	6.71c " "
32	7.215c " "

If the cost of burden is decreased the corresponding percentage should be deducted from the standard.

Form 176

ILLUSTRATION 177

Burden rate standard, but mill running full time on partial equipment.

According to the reports of the week the mill ran for 48 hours but one-half of the equipment was idle, and at the same time the operating part of the equipment was only 92% efficient. One-half of the equipment represents 1,728 frame hours from which the production loss of 286 frame hours must be deducted which equals 1,442 frame hours actually operating.

According to Table 7 the above frame hours are equal to an increase of burden cost of 98% which must be added to the standard burden cost of the week in order to obtain the actual manufacturing burden for that week.

The department reports the production of the following filling yarns during the week:

Nos. 12, 15, 16, 22, 26, 32,

for which the standard manufacturing burden rate is as follows:

Yarn Number	Standard Burden Cost
12	3.3c per pound
15	4.1c " "
16	4.4c " "
22	5.4c " "
26	5.95c " "
32	6.4c " "

By adding the increase of 98% to the above standards the actual manufacturing burden for the week is obtained as follows:

Yarn Number	Manufacturing Burden Cost for the Week
12	6.52c per pound
15	8.12c " "
16	8.71c " "
22	10.69c " "
26	11.78c " "
32	12.67c " "

Form 177

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